PROCEEDINGS

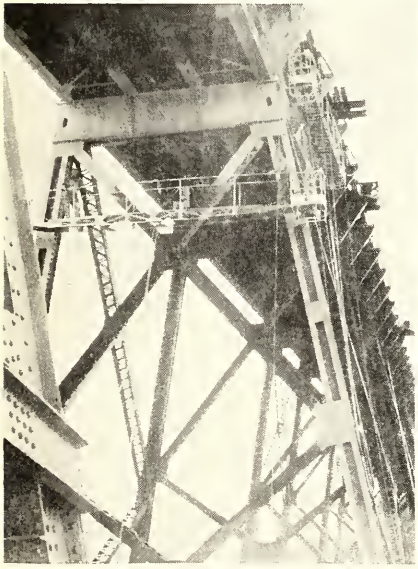
Seventy-Fourth Annual Convention

OF THE

American Railway Bridge & Building Association

1969

THE HIGH ROAD—Painting as he goes this painter walks a Spider Staging along a main cable of the Chesapeake Bay Bridge.



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Proceedings of the

Seventy-Fourth Annual Convention

of the

American Railway
Bridge & Building
Association

Held at

CHICAGO, ILLINOIS

September 9–11, 1969

Published by the Association
Elsworth L. Abbott, Editor
201 W. Harrison, Chicago, Ill. 60607

CONTENT

Officers for 1969 6
Officers for 1970 7
Resumé of Convention 9
New Committee Subjects 16
Address by President W. F. Armstrong 17
Treasurer's Report 19
Secretary's Report 20
Report of Auditing Committee 21
Report of Necrology Committee 22
Report of Resolutions Committee 23

Historical Information
- List of Annual Conventions 45
- Past Officers 47

Constitution 51
By-Laws 54

Directory of Members
- Honorary Members 57
- Life Members 57
- Alphabetical List of All Members 59
- Membership by Roads 106
- Other Affiliations 116

Special Feature
- Inspection of Structures 29

Report of the Honorary Membership Committee 16
Bibliography of Contents of Past Proceedings 117

Committee Reports

Tools and Equipment for B&B Work
- Heavy Equipment for B&B Work 25
- Portable Power Tools for B&B Work 26

Concrete Trestle Ties—Their Manufacture and Installation 32
Prefabricated Panels for Bridge Renewals—Practicality and Economics 35
Communications Between Management, Supervisors and Men 40

INDEX TO ADVERTISERS

ABEX Corp. ..... Inside Second Cover
American Bridge Div., U. S. Steel Corp. 24
Armco Steel Corp. 44
Associated Pile & Fitting Corp. 80
Bird Tie Pads, Inc. 56
Chance Co., A. B. ..... Second Cover
Colt Industries, Fairbanks Morse 80
Cox Company, W. T. 82
Du Pont de Nemours & Co., I. E. 58
Ever Tight Bolt Assembly Co. 82

INDEX TO ADVERTISERS—Continued

Fairchild Construction Co., Ltd., W. R. 84
Fairmont Railway Motors, Inc. 60
Horne, Boatright Chemical Co., Inc. 84
Huck Manufacturing Co. 8
Jackson Vibrators, Inc. 86
Kershaw Manufacturing Co., Inc. 86
Ketler Co., F. K. 62
Schield Bantam Div. of Koehring Co. 64
Lewis Bolt & Nut Co. 88
National Lead Co. 88
Osmose Wood Preserving Co. of America, Inc. 66
Penetryn System, Inc. 90
Pettibone Corporation ..... Back Cover
Portec, Inc. 90
Racine Hydraulics & Machinery, Inc. 68
Rails Co., The 70
Railway Maintenance Corp. 94
Railway Products Co. 72
Snyder Co. 74
Spider Staging Sales Co. ..... Inside Front Cover
Suburban Propane 76
Templeton, Kenly & Co. 92
Texaco, Inc. 92
Torrington Co., The ..... Inside Back Cover
Turzillo Contracting Co., Lee 78
Western Cullen Div., Federal Sign & Signal Corp. 94

ENGINEERS' & CONTRACTORS' DIRECTORY

Atlas Railroad Construction Co. 96
Cayuga Construction Corp. 96
Dames & Moore 96
De Leuw, Cather & Co. 96
Fairchild Construction Co., Ltd., W. R. 84
Hazelet & Erdal 98
Modjeski & Masters 98
Nielsen Co., S. N. 98
Parsons, Brinckerhoff, Quade & Douglas 98
Railway Techniques, Inc. 100
Sverdrup & Parcel and Associates, Inc. 100
Tidewater Construction Corp. 100
Turzillo Corp. 78

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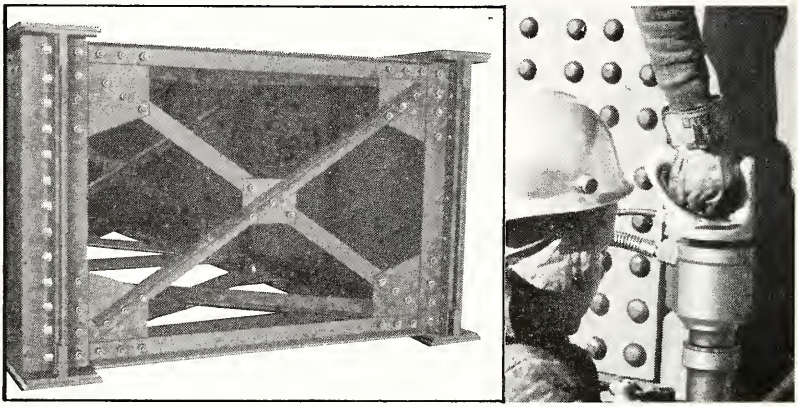

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PROCEEDINGS

The Event—74th Annual Convention of the American Railway Bridge and Building Association

The Date—September 9–11, 1969

The Place—Conrad Hilton Hotel, Chicago, Illinois

The 74th Annual Convention of the American Railway Bridge and Building Association was held on September 9–11, 1969 at the Conrad Hilton Hotel, Chicago. Our convention was held in conjunction with the 81st Annual Convention of the Roadmasters and Maintenance of Way Association of America.

Except for two half-day joint sessions, meetings were held separately by the two groups and programs consisted mostly of the presentation of committee reports. These proceedings include abstracts, excerpts and in some cases full reports as presented at the B & B sessions.

Also included is a directory of members, the Constitution and By-Laws of the Association and other current and historical information.

Total registration for the joint convention was 2,126. This includes 155 associated members and 131 association guests. In addition there were 180 railroad members of the association, 16 guests of both associations and 228 ladies. It is interesting to note that of those registered 60 are members of both associations.

The joint session on Monday was the opening meeting of the convention and featured addresses by L. S. Provo, president, Chicago & North Western; Kenneth L. Lawson, senior engineer, Office of High-Speed Ground Transportation, Department of Transportation. Greetings were conveyed to the Association by A. L. Sams, vice president, American Railway Engineering Association and C. E. Godfrey, president, Railway Engineering—Maintenance Suppliers Association. Floyd Johnson, first vice president, REMSA also spoke briefly.

The down-to-earth title of Mr. Provo's address, "Physical Properties Must be Modernized," pointed out that the physical plant of the railroads is still largely the one that was laid down in the 19th century and that "much effort and agony, comes from utilizing or adjusting this plant to meet 20th century requirements."

Mr. Lawson in his address on "The Role of Research in Track Safety," explained the relationship between his department and the railroad industry and their relationship to the federal government as a whole. He pointed out that safety will never be an absolute thing and "it isn't something that you can ever expect to obtain 100 percent." Referring to the promulgation of "performance regulations," Mr. Lawson said that "we would not promulgate such regulations or rules without also trying to provide you with assistance to respond thereto."

Recalling the past and projecting into the future, Mr. Perlman's address "We Must Keep Up With Technology," emphasized the technological advancements from early day railroading. As an example, he pointed out that in earlier years a man could put in some eight ties in a day—modern equipment can now install 1000 ties a day and manufacturers are developing equipment that can double this production. Mr. Perlman pointed out that to "meet the great challenges to our industry" we must give our highest attention to all the tools that are available, forgetting what we did in the past and take full advantage of present opportunities.

Significant extracts from the three addresses are included here.

"If everything depended on experience alone," Mr. Provo said, "the railroads would be far ahead of all other forms of transportation in meeting the needs of our growing economy.

"But the performance records, as you are well aware, show that the railroads, as passenger carriers, have moved from the top to almost the bottom of the list. In the field of freight we can take small satisfaction from last year's record in freight ton miles handled by the industry. This was more a reflection of growth in national productivity than competitive leadership. The fact remains that we have for several decades continued to show a downward trend in our share of the nation's total freight traffic as compared to truck, inland, waterway, pipeline and air freight competition.

"I think one reason for this, which is of direct and immediate concern to you, is the fact that our physical plant is still largely the one that was laid down in the 19th century. Much of our efforts, and even agony, comes from utilizing or adjusting this plant to meet 20th century requirements.

"Not a single one of our competitors in other modes has been faced with this situation. The highway system, which constitutes the truckers' right of way, has gone through tremendous changes. The first dirt roads have metamorphosed into double lane highways and most of these have long ago been widened and to a large degree completely rebuilt to meet the vast growth and changes in highway traffic.

"Much of the same can be said of our inland waterways on which tows with barge capacities equivalent to our largest freight trains are plying channels that are deeper and straighter than those that were available to barge operators of as recently as a decade ago. The nature of the improvements is not as significant as the fact that they were made at no cost to the barge operators.

"And, of course, we know that bigger jets—vastly larger than the giants that now land on and take off from our major airports—are soon to come off the production lines. These, in turn, will make most of our modern airports obsolete.

"It has been public policy for government—local, state or Federal—to build and maintain the rights of way used by these forms of transportation. It has also been public policy that the railroads pay the full cost of maintaining their own rights of way. On top of this, part of the taxes railroads pay have been used to help defray the cost of airline terminals and, of course, the highway system.

"It is not my objective here to get into a discussion over the inequities railroads face as compared with their competitors on maintenance of way problems. The fact remains, however, that the problems of any form of transportation are decreased to an enormous degree if the public picks up all or a substantial part of the maintenance of way bill.

"It behooves all of us to do everything we can to shrink back our national railway plant to the size and configuration it needs to be a vital growing national asset in the 1970's. The situation I described is not a new one to the railroad industry. In the past, our industry has shown great viability and strength in meeting these types of challenges. I have every confidence it will do so in the future.

"Railroad management is fully aware that its maintenance departments would like to have more money for men and material. Management has the responsibility, in an industry that is not noted for an adequate return on investment, to get the greatest possible return on every dollar spent.

"In the by-gone prosperous era of railroading—which, incidentally, was before my time—the trend was to build highly durable physical railroad plants—and even to overbuild. In those days railroads did not build structures; they built monuments. Typical are some of our passenger terminals; when

North Western's Chicago terminal was built in 1911, the chief executive at that time said it would last for all time to come.

"Now when our engineers plan alterations to that building, they are inclined to say the old boy was right.

"However, the emphasis on durability and strength has had benefits in a few areas, particularly in bridge construction.

"By being overly cautious, we built bridges that would hold much more than they were required to at the time they were built. Because of this, our bridges are now able to much better handle the increase in loads than can highway bridges built by various units of government.

"But to come back to my main point, the railroads today do not reflect the prosperity of the industry at the turn of the century. The impact of competition and steadily rising costs makes it imperative that all departments of a railroad adopt the strongest of disciplines in determining application of expenditures on the basis of priorities of need and to make each dollar stretch further by seasoning it with ingenuity and good judgment in application.

"Aside from the money problem, one of my greatest concerns in the area of maintenance is productivity. And when I say productivity, I don't mean how many miles of ballast are fixed per day, I mean productivity in terms of the engineering department's contribution to the overall efficiency of the railroad. Probably the best example of what I mean is maintenance of track structure in the train yards.

"I found it takes some sort of divine guidance to get the engineering department into our yards to repair just a few hundred feet of track. The point is, in many cases, that maintaining that short yard trackage may be more important to the operating efficiency of the railroad than doing an absolutely gorgeous job on twenty miles of main-line track.

"Most of the type of work I'm discussing falls under the category of non-programmed work. Too often there is a tendency to give short shrift to the non-programmed work when it is this type of work that can provide the greatest increase in efficiency.

"One of the major reasons engineering prefers main line work or programmed work is equipment. Most of the maintenance equipment which has been developed in the past ten years has been for the big jobs, not the small, short-track work. This equipment, in many cases, is difficult to move into position in a yard and often takes a crew to run it. This factor, too, has reinforced the tendency of the engineering department to concentrate on the big work with a resultant loss of productivity in terms of helping the overall operation.

"Suppliers have done a fine job of creating equipment for the big jobs. I would like to challenge them now to concentrate on developing the types of equipment needed for the smaller types of work. There is a very large contribution to be made here.

"Another problem area hampering the development of the proper allocation of maintenance-of-way funds has been the lack of track standards. While I am not an engineer, I have a high respect for the profession and the emphasis it has on perfection in construction. Yet I have never obtained a satisfactory answer to the question: precisely to what degree shall a track be maintained for a given amount of train operation? I predict that establishment of such definite standards will be one of the breakthroughs in M of W planning and budgeting in the near future.

"There are several railroads, among them the North Western, which are taking steps that I hope will eventually lead to the establishment of such standards. These roads are working in the area of developing more precise and efficient means of determining desirable track conditions. On the North Western, for example, we are utilizing high speed measuring devices to record track irregularities, such as gauge, alignment, cross elevation and low joints. The equipment we are experimenting with

to register the data is in cars moving at maximum timecard speed. The objective is to give us a better analysis of track conditions so that we can plan more efficiently where to spend our track maintenance funds, and, after incurring that expense, to determine whether or not the results satisfy our transportation as well as our engineering departments.

"The name of the game for our railroads in all departments, not just in M of W, is to apply imagination and ingenuity to the limited funds we have to work with to maximize the results we seek. In your field, of course, research is extremely essential. We need to develop methods for better drainage, improvements in ties, whether they be wooden, concrete, plastic or some other material; and, of course, the continued installation of welded rail where it is most applicable. Today you have a wide selection of structural materials that did not even exist in the not too distant past. Examples of what I am referring to are reinforced or prestressed concrete for bridges, and a wide variety of materials that facilitate construction of shop and other buildings that are functional and durable but not so durable that they defy replacement when they become obsolete.

"Everything indicates that our economy will continue to grow as far in the future as we can see and that national productivity will continue to climb at a rapid pace. All this means that the railroads are faced with a tremendous challenge.

"The industry will continue to depend heavily upon you as a major contributor to its financial well being," Mr. Provo concluded.

Mr. Lawson, in his address, indicated that for the federal government to promulgate performance regulations or rules, it is their thinking that they will also have to "back it up with money, research, study, workshops and the like, in order to do it intelligently.

"And another very important point, and this is one I have heard Mr. Whitman repeat many times in discussing the subject, is that we most certainly would not ever promulgate a regulation which did not take into account the speed, equipment, and commodity involved in a particular line of road. Naturally, perhaps this isn't obvious to you, or you might think it is not obvious to us, no one would ever expect a branch-line track to be maintained at the same standards as main-line track.

"In many respects our attitude towards this thing is summarized in characterization which I for one would like to give to Mr. Lang's administration, and which some of you may have mixed emotions about, that is basically a role, as he saw it, of being a "Dutch Uncle" to the industry. And here again, if we take recourse to Webster we find a very good definition, a "Dutch Uncle" is a critical but well-meaning, a severe but well-meaning critic.

"Now we look forward very optimistically to an increased coordination and cooperation with the industry, basically through the AAR, the AREA, or organizations such as yourselves, but more specifically the AAR.

"I think there is some very good ground for us to draw some gray lines and say, "The federal government will concentrate on the basic research, the high risk areas, which are difficult for boards of directors to appreciate, the future risk options, and so forth, while the AAR and other people with resources concentrate on the near term, immediate problems, as you have, of course, been doing mostly in the past, and, of course, those items which are directly profit motivated.

"One of the things therefore that we would hope to output from our research program would be criteria and understanding of the basic phenomena that are involved, so that the test of which is the ability to predict what will happen in a set of circumstances. I for one would never put my name to a standard, or anything so-called, that I could not tell why it was what it was, why an inch of superelevation was too much. We have got to strive to be at a point where we can say it is more

than experience what will happen if it isn't done that way.

"This will not happen over night. This is something that takes years. For example, tools have to be built. It has taken ourselves and many railroads several years to develop track measuring-cars that are even useful, let alone efficient.

"We have long-range plans for things like dynamic laboratories where the simulation of road and track can be done in a safe, controlled environment, in houses. These things will take years to implement and millions of dollars.

"There are certain things that track engineers know, as I understand it, that they don't talk about except among themselves. Somehow this has got to be tapped. We've got to get the facts on the line. Otherwise, the alternatives are rather difficult to contemplate.

"Therefore, we have a common purpose, a common concern, and if any message is put forward by me today I would like to make that the theme of it, that we intend, and we hope that we will all work together, to make the railroads safer. Please recall, everyone is aware that the railroads relatively are safe. But we can't rest on false security and say we're not as dangerous as other modes or something like this. They can be made safer. Let's all try to make them safer," Mr. Lawson concluded.

Penn Central Transportation Co. President A. E. Perlman, drawing on his vast knowledge of railroading, past and present, recalled work methods of the past and equated them with present day methods. He pointed out that "in the last five years modern surfacing equipment that you have heard a lot about here, the newest tampers, have combined the three tasks of raising, tamping and aligning track in one operation, so that you can surface and align 8,000 feet a day. And advanced methods of sonic tamping will permit us shortly to surface about five to six miles a day.

"And you all know, I don't need to tell you about the tremendous benefits that welded rail is giving to the track.

"And in the old days you had to have a pretty good eye for aligning and surfacing. You had to have a pretty good eye for rail defects. And as you know, the Penn Central, which I can speak the best about, has developed an electronic track-inspection system that enables our people to keep more accurate appraisal of track conditions than they ever could before.

"This system, which we call 'Tracon,' was developed by our Technical Research Lab in Cleveland. It provides for electronic inspection of the cross level of track and switches by instrumented-equipped train traveling at more than 35 miles an hour. This is a lot different than the old one-man motor car that we used to have to inspect the track with. It records every slight deviation from a perfectly smooth ride and accurately pinpoints areas maintenance work is necessary.

"One of the major advantages of this system is that it provides statistical information on track conditions without analysis of extensive comparative records, which is a time-consuming procedure.

"Our Cleveland Lab is doing a great many other things in basic research in the area of railroad right-of-way. For instance, it is conducting studies of track modulus to find the whole structure of track, how the ties, track, and ballast behave dynamically under daily stress of locomotive and car movement. With highly sophisticated instrumentation, the lab is monitoring various aspects of track stability from a moving vehicle as well as from stationary vantage points.

"From results of these tests and others, we expect to design better methods of tailoring our track structure to the terrain on which it is laid, whether it be firm ground, bedrock, or loose soil.

"This is where your ingenuity is called upon to help translate the results of the fundamental research generated by the space age into practical appli-

cations for your railroads. The nuclear physicist or biochemist has done a great service to humanity in the fields of basic research over the past 30 years. But it takes someone with the understanding, temperament and practical mind of a Kettering to adapt this fundamental knowledge into specific methods and machines that can be of service in the operations of the railroad.

"These are excitingly challenging times, and we must keep up with them. We can look at a 1958 automobile and see that it's obsolete. Yet a man who has graduated ten years ago from the finest engineering school in the country and who has not kept up to date with the challenges of the new technology is far more obsolete than is a 10-year old automobile.

"Let me give you just one example that is familiar to many of you here. I happen to be Chairman of the Visiting Committee of the Civil Engineering Department of MIT. They have absolutely revolutionized the teaching of civil engineering with the use of computers. Ten years ago, a bridge that was fixed at both ends, that is, one that didn't have rollers to take care of the expansion on one end, was called an indeterminate structure and you could struggle for months on a complicated span to compute the stresses generated in the structure. But today, by the use of a computer, a student can get the answer in less than an hour.

"By the same token, in designing a large building the computer can accurately rotate the design through any angle and obtain the stresses caused by wind, snow loads, and any of the other stresses which might complicate the design calculations. As a result, designs are much more accurate and efficient.

"In one large steel complex that was built on our railroad in the last two years, they saved over a million dollars in the design of that building in the materials used in the construction of that building through the use of computer technology in the civil engineering.

"We see the same results in the new machines where cybernetics is used to line and surface track. The computer calculates automatically the line and surface for curves, spirals, and tangents, and automatically controls the work of the machines.

"You are all highly intelligent and well motivated people. And even those without a formal technical education can master many of the techniques in this new technology. The term cybernetics, as an example, seems like a jaw breaker. But the principles can be easily mastered.

"I have given a simple illustration many times of the cybernetic system of command and control system in a human being. As an example, I put up my hand, and this is a little bit warm, but just comfortable. But, if that was the lid of a stove and there was a fire in there, that hand would go up automatically, just like that. I can keep it on here for a few minutes right now, but not too long. And if it were a cake of ice I would probably take it off in a hurry.

"So, what has happened to me? I get input into my brain, it goes into my fingers and goes up there. Now that has sort of a memory system. When I was a child probably I did get burned with a stove lid. So this calculates what is going to happen and the comfort I'm having and all. If it is real hot, the brain tells the nervous system, 'You'd better get that hand the hell off there in a hurry,' and that hand comes off in a hurry automatically.

"Now that's the whole system of cybernetics. You use a computer because a computer could fill this building up, a third generation computer, you could fill it up with files, but if you put that in the computer memory system, every one of those facts can be pulled out in a millionth of a second and these variables fed into the computer. They can come out then with an answer, depending on the program,

giving you the best answer for all the variables.

"If we are to survive and prosper, we've got to forget what we did in the past and take full advantage of these present opportunities and speed up the processes of innovation and change. We've got to do it.

"Understanding of this fact is vital among senior and middle management, who must impart it to the future generations of managers just entering our industry's service. These people, these young people, are our key to the future. It's imperative that we offer these bright, dedicated people a chance to work on our most challenging problems, in a climate where they can come to you just like when they were real small children and say to their dad, 'What's that man doing? Why? How? Where?' And all these other things. Sure, they drive you to despair, but that's the only way you are going to renew your youth and this industry is going to renew its youth, by just those questioning kind of minds.

"The industry has a constant and urgent need for new management people with a built-in attitude of constructive discontent. And I say constructive. We are all discontented but we want to be constructively discontented. Such an attitude strengthens railroading's competitive posture and provides a breeding ground for new ideas and new thinking that inevitably will result in innovation.

"You as members of railroad management must play a dual role in this process. On the one hand, each of you must seek current innovation in railroad techniques and find new ways to adapt modern technology to daily tasks. On the other hand, you must give the needed training and time to our younger people, and the proper climate to these people, who are our future management, to give them a solid working foundation of your knowledge upon which they can build the future of our industry.

"The challenge is yours and that of every other member of management in our industry.

"Working together with vision and understanding is a key step toward 21st-century rail transportation. Constructive cooperation between management and labor, removal of outmoded regulations, and increased government support of necessary passenger service are equally essential to our industry's progress. In combination, they can bring prosperity to the industry," Mr. Perlman said in conclusion.

B&B SEPARATE SESSIONS

Separate sessions of the Bridge and Building convention held Tuesday, Wednesday and Thursday mornings were presided over by President W. F. Armstrong, Engineer of Buildings, Chicago & North Western. The following subject reports were presented on Tuesday:

• Report of Special Committee No. 2—Prefabricated Panels for Bridge Renewals—Practicality and Economics, L. C. Harris, chairman. Illustrated with slides. Mr. Harris is assistant engineer, Atchison, Topeka & Santa Fe.

The Wednesday morning separate session included the following reports:

• Report of Special Committee No. 3—Communication Between Management, Supervisors, and Men, J. C. Hobbs, chairman. Mr. Hobbs is engineer track and structures, Richmond, Fredericksburg & Potomac.

• Color motion picture—"Listen Please" was introduced by C. G. Kersey, director personnel development, Chicago, Burlington & Quincy.

• Report of Special Committee No. 1—Concrete Trestle Ties—Their Manufacture and Installation, A. C. Jones, chairman. This included a color motion picture. Mr. Jones is process engineer—structures, Southern.

Several reports of special interest were presented at the Thursday morning separate session:

• Report of Standing Committee No. 1—New Materials, G. N. Sells, chairman. Mr. Sells is general foreman B&B & WS, Atchison, Topeka & Santa Fe.

• Report of Standing Committee No. 2—Tools and Equipment for B&B Work, J. W. Chambers, chairman, included two Subcommittee Reports. Mr. Chambers is bridge construction engineer, Missouri Pacific.

• A motion picture "The Wood That Could," was preceded by remarks by M. J. Rhude, director of timber engineering, Kippers Co.

One of the highlights of the B&B program was a special feature presented Thursday by Messrs. J. W. DeValle, chief engineer bridges, Southern, E. E. Runde, assistant to engineer bridges, Illinois Central, and T. A. Reynolds, assistant division engineer, Penn Central Transportation Co. The feature titled "Inspection of Masonry Structures and Steel Bridges" was illustrated with slides.

During the regular order of business on Wednesday Mr. J. M. Lowry, past president and chairman of the Honorary Membership Committee, placed the name of Mr. R. R. Gunderson in nomination to become an honorary member of the Association. There being no dissenting votes, Mr. Gunderson was escorted to the rostrum by Past President DeValle where he received a scroll in recognition of long and devoted service to the Association and was unanimously elected an Honorary Member.

The Secretary's report, the Treasurer's report, the report of the Auditing Committee, and the report of the Necrology Committee were presented on Thursday and are included elsewhere in these Proceedings.

ELECTION OF OFFICERS

The following were elected officers of the B&B Association for 1969–1970:

President—J. A. Goforth, chief engineer, Clinchfield, Erwin, Tenn.; First Vice President—A. R. Dahlberg, assistant engineer, Atchison, Topeka & Santa Fe, Amarillo, Tex.; Second Vice President—T. L. Fuller, engineer bridges, Southern Pacific Transportation Co., San Francisco, Calif.; Third Vice President—N. D. Bryant, assistant bridge engineer construction and maintenance, St. Louis–San Francisco, Springfield, Mo. The Past President is W. F. Armstrong, engineer of buildings, Chicago & North Western; Treasurer—W. H. Huffman, chief engineer, Chicago & North Western; Secretary—Ruth Weggeberg.

Directors of the Association are:

Term Expires 1970—

A. C. Jones, Jr., process engineer—structures, Southern; W. H. Rankin, Sr., structural engineer, St. Louis–San Francisco; E. E. Runde, assistant to engineer bridges, Illinois Central.

Term Expires 1971—

T. A. Reynolds, assistant division engineer, Penn Central Transportation Co.; J. J. Ridgeway, engineer structure processes, Bessemer & Lake Erie; J. R. Williams, engineer bridges, Chicago, Rock Island & Pacific.

Term Expires 1972—

J. W. Chambers, bridge construction engineer, Missouri Pacific; R. E. Frame, chief engineer, Southern Pacific Transportation Co.; J. C. Hobbs, engineer track and structures, Richmond, Fredericksburg & Potomac.

NEW COMMITTEE SUBJECTS

In addition to the two standing committee subjects—New Materials for B&B Work and Tools and Equipment for B&B Work, 3 additional subjects have been selected from which committee reports will be presented at next September's Convention. The subjects chosen are as follows:

• Maintenance and Renewal of Tunnel Linings.

• Post Piling Using Epoxy Resin.

• Progress in Development and Testing Track Scales for Coupled in Motion Weighing.

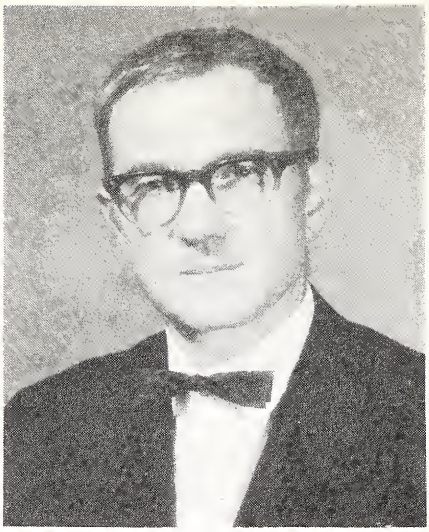
Standing Committee 1 will report on Materials—Waterproofing and Standing Committee 2 will report on Hy-Rail Work Equipment.

1970 CONVENTION

The 1970 Convention will be held at the Sherman House, Chicago, Ill., September 27–30.

The President's Report

By W. F. Armstrong
Engineer of Buildings, Chicago & North Western



At this time, as outlined in our By-Laws, I must report to the Association membership on the affairs of the American Railway Bridge and Building Association.

The financial condition is somewhat better than a year ago, being $5562 this year where the balance a year ago was $4293. Expenses keep increasing each year; however, the advertising that has been sold in the 1968 Proceedings helped to better our financial condition. This reflects the efforts of the Advertising Committee and its Chairman, Mr. Dahlberg.

The total membership has declined slightly during the past year. We now have a total of 746 members compared to 782 a year ago. We will need the efforts of all of our members to get new members for the Association. We need to encourage younger railroad men to become involved in the Association.

REMSA has the largest exhibit ever in the International Amphitheater and I know that you will probably all attend. We have left Tuesday and Wednesday afternoons free so that Association members can inspect the many and interesting exhibits.

The ladies will register and have their luncheon and program in the Boulevard Room, rather than in the Bel Air room as in the past. The Luncheon will be Wednesday noon followed by an interesting program given by Paula Bishop on the White House and the ladies who ruled it from Martha to Lady Bird.

Wednesday evening the annual banquet will be sponsored by REMSA. This will take place in the International Ballroom rather than in the Grand Ballroom as in the past. As usual this will be an excellent dinner followed by top-notch entertainment.

Your Executive Committee selects the Special Subjects Committee reports from the response cards. You will be receiving these cards shortly and the Executive Committee would appreciate your careful consideration of the subjects for the 1970 reports and ask that you make suggestions for new subjects.

I am honored to present to you this fine and devoted group of officers and directors who comprise your Executive Committee. These gentlemen have spent many hours on the affairs of your Association and on the planning of this Convention. This Convention could not be a success without their efforts. I will introduce them to you, and wish to request each of them to stand as their name is called in order that you may get to know them by sight. Several of them are now busy with the details of the convention and are not present at this time. Will you please withhold your applause until all have been introduced.

The first person that I should like to introduce to you is Mrs. Ruth Weggeberg, our Secretary. I am sorry that her duties at our registration desk prevents her being present at this time. You officers and directors rely on her

for the many details of the Association's business, year after year.

Next I should like to introduce to you our three youngest Directors, which you selected at our business session last fall. Alphabetically, the first is Mr. T. A. Reynolds, Asst. Div. Engr., Penn Central, Boston, Mass. Mr. Reynolds is a member of our Ladies Entertainment and membership committees.

J. J. Ridgeway, Engineer Structures —Process, of the Bessemer and Lake Erie, Greenville, Pa. Mr. Ridgeway serves on the Special Subjects and Necrology committees and is a Sponsor of our Standing Committee #1.

J. R. Williams, Engineer of Bridges, C. R. I. & P., Chicago. Mr. Williams is a member of the Convention Greeting and Registration Desk Committees.

The next group of Directors have served you a little longer, and are, perhaps, better known to you. Again alphabetically, the first is Mr. A. C. Jones, Process Engineer—Structures, Southern, Atlanta. A. C. is a member of the Advertising, Convention Greeting and Special Subjects Committees. He and his committee have prepared the report of Special Committee #1 Concrete Trestle Ties. He is one of the spark plugs of the B. & B. Assn. and has been involved in many of the recent reports.

W. H. Rankin, Senior Structural Engineer, Frisco, Springfield, Mo. is next. Mr. Rankin is a valued member of the Convention Greeting, and special Subjects Committees and is Sponsor of Special Subject Committee #3 Communications Between Management, Supervisors and Men.

Mr. E. E. Runde, Asst. Engineer of Bridges, I. C., Chicago, is Chairman of the Ladies Entertainment Committee. He has done so well in keeping our ladies happy during the past years that we kept him on for another year. He is also a member of the Hotel Arrangements Committee and is sponsor of Special Committee No. 2 Prefabricated Panels for Bridge Renewals.

Senior to the other directors are the final three. Mr. H. F. Lucas, Asst. Engineer, Milwaukee Road, Chicago. Mr. Lucas is Chairman of the Registration Desk Committee, and also serves on the Ladies Entertainment Committee. Mr. Lucas (Henry) is retiring from the Milwaukee Road and we wish him many happy years of retirement.

W. L. Short, Bridge Maintenance Engineer, Missouri Pacific, St. Louis, is Chairman of the Membership Committee and serves on the Registration Desk Committee.

The last of the group, alphabetically, is Mr. C. E. Watchter, B. & B. Master, C. N., Port Arthur, Ont. Canada. Mr. Wachter is Chairman of our Necrology Committee and also helps out on Membership and Registration Desk Committees.

Mr. W. H. Huffman, Chief Engineer, Chicago & North Western, Chicago, is Treasurer and also one of our esteemed past Presidents. Hiene and I are jointly charged with the responsibility of signing the checks on the B. & B. treasury.

Mr. J. W. DeValle, Chief Engineer Bridges, Southern, Atlanta, is our immediate Past President, and has continued to serve your Association ably during this past year. We are indeed indebted to Joel for his wise counsel throughout the past year.

Mr. T. L. Fuller, Engineer Bridges, Southern Pacific, San Francisco, is our Third Vice President. Tom is Chairman of our very important Special Subjects Committee. He did an especially good job of organizing the Committee work this year.

Mr. A. R. Dahlberg, Asst. Engineer, Santa Fe, Amarillo, is our Second Vice President. Al is our Chairman of the Advertising Committee. Advertising for the Proceedings is one of our major sources of income. Through his untiring efforts we have been able to keep your Association solvent during this period of rising costs.

The last name on our list is that of Mr. J. A. Goforth, Chief Engineer,

Clinchfield, Erwin, Tenn. Jim has been our right hand man and your First Vice President. The success of our Convention and our Association is due in a large measure to his handy work during the past years.

I also would like to give recognition to the other members of your Association who serve on the Executive Committee, and give so much support to your Directors and Officers.

Mr. R. C. Baker, retired Asst. Chief Engineer, C. & E. I., Danville, Ill., who is a past President and a member of the Honorary membership Committee.

Mr. W. A. Buckmaster, retired Asst. Division Engineer, B. & O., Chicago, who is a member of the Auditing Com.

Mr. M. H. Dick, Vice President and Editor, Railway Track and Structures, who is Chairman of the Convention Program Committee. Merwin is a Past President and one of the reliable members of the Association. He has headed this committee for many years.

Mr. R. E. Dove, Associate Editor, Railway Track and Structures, is Chairman of the Hotel Arrangements Committee. Bob does the behind the scenes work with the Hotel which is so important to a successful convention.

Mr. R. D. Hellweg, Asst. Regional Engineer, G. M. & O., Bloomington, Ill., is a Past President and serves on the Honorary Membership Committee and is Chairman of the Nominating Committee. Bob can always be counted on for good advice in the affairs of your Association.

Mr. J. M. Lowry, Asst. Chief Engineer, Southern Pacific, Houston, Tex., is a Past President and Chairman of the Honorary Membership Committee and a valued member of the Nominating Committee.

E. R. Schalf, Supt. of Fire Prevention, I. C., Chicago, is Chairman of the Auditing Committee and a Past President. He is also a member of the Nominating Committee and the Honorary Membership Committee.

Mr. H. M. Wilson, is a Past President and a member of the Honorary Membership and Nominating committees.

TREASURER'S REPORT

PERIOD SEPTEMBER 1, 1968 TO AUGUST 31, 1969

Balance—August 31, 1968		$ 4,293.20
RECEIPTS:		
Dues—1970	$2,947.00	
Dues—1969	1,883.00	
1967 Advertising	470.00	
1968 Advertising	3,234.75	
Sale of Proceedings	15.00	8,549.75
Total Receipts		$12,842.95

DISBURSEMENTS:		
Salaries (Secretary and Assistant)	$2,239.71	
Withholding and Social Security	683.04	
Stationery and Printing	489.56	
Office Supplies	51.78	
Office Rent, Telephone, Etc.	361.17	
Postage	248.10	
1968 Proceedings	2,869.90	
1967 Proceedings	19.45	
1968 Advertising	48.24	
1968 Convention Expenses	225.48	
Miscellaneous	26.63	
Membership Certificates	1.25	
Surety Bonds	26.00	7,290.31
Balance—August 31, 1969		$ 5,552.64
Cash on Hand—First National Bank of Chicago, August 31, 1969		$ 5,552.64

September 3, 1969

APPROVED:

E. R. Schlaf, Chairman
W. A. Buckmaster
H. M. Wilson

SECRETARY'S REPORT

REPORT OF MEMBERSHIP FOR PERIOD SEPTEMBER 7, 1968 TO SEPTEMBER 7, 1969

ACTIVE MEMBERSHIP:			
Total Active Members, September 7, 1968			574
New Active Members since September 7, 1968			38
Reinstated—Paid back dues			2
			614
LESS—Resigned Account Retirement, etc.	14		
Members Reported Deceased	8		
Transferred from Active to Associate	1		
Transferred to Life Membership	19		
Dropped for Non-Payment of Dues	42	84	
TOTAL ACTIVE MEMBERS			530

ASSOCIATE MEMBERS:			
Total Associate Members, September 7, 1968		77	
New Associate Members since September 7, 1968		5	
Transferred from Active to Associate		1	
		83	
LESS—Resigned Account Retirement, etc.	5		
Transferred to Life Membership	1		
Dropped for Non-Payment of Dues	5	11	
TOTAL ASSOCIATE MEMBERS			72
LIFE MEMBERS:			
Total Life Members, September 7, 1968		123	
Transferred from Active and Associate Membership		20	
		143	
LESS—Reported Deceased		6	
TOTAL LIFE MEMBERS			137
HONORARY MEMBERS:			
Total Honorary Members, September 7, 1968		8	
Honorary Member added September 9, 1968		1	
		9	
LESS—Reported Deceased		2	
TOTAL HONORARY MEMBERS			7
TOTAL MEMBERSHIP—ALL CLASSES—SEPTEMBER 7, 1969			746

REPORT OF AUDITING COMMITTEE

TO MEMBERS OF THE
AMERICAN RAILWAY BRIDGE & BUILDING ASSOCIATION:

Gentlemen:

The undersigned have examined the books of the Secretary and report of the Treasurer for the period from September 1, 1968, to August 31, 1969, inclusive, and have found them to be correct as of the latter date.

Respectfully submitted,

E. R. Schlaf, *Chairman*
W. A. Buckmaster
H. M. Wilson

September 3, 1969

REPORT OF NECROLOGY COMMITTEE

1968–1969

To the President and Members of the

AMERICAN RAILWAY BRIDGE & BUILDING ASSOCIATION

We regret to advise we have learned of the loss of fifteen (15) members through death during the year. It is possible that other members have passed away during the year of whom we have no information. If you know of any, we would like to have their names to include in the list to be printed in the Annual Proceedings. The following have been reported since our last Annual Meeting in September, 1968.

ACTIVE MEMBERS	TITLE—RAILROAD	YEAR JOINED	DECEASED
H. M. Dalziel (Ret.)	Chief Engineer South Buffalo Bethlehem, Pa.	1959	Jan., 1969
H. L. Johnson	Bridge & Building Supervisor Missouri Pacific DeQuincy, La.	1963	Oct., 1968
D. L. McGuire	General Foreman Bridge & Building Penn Central Columbus, Ohio	1967	June, 1968
H. A. Matthews	General Foreman B&B–W.S. St. Louis–San Francisco Amory, Miss.	1949	Feb., 1969
E. D. Rice	Bridge & Building Supervisor Chicago & Eastern Illinois Danville, Ill.	1949	Feb., 1968
N. H. Williams	Bridge & Building Master—System Delaware & Hudson Albany, N. Y.	1947	Sept., 1968
R. A. Youngblood	General Bridge Supervisor Southern Savannah, Ga.	1957	Jan., 1969
HONORARY MEMBERS			
E. H. Barnhart (Ret.)	Division Engineer Maintenance of Way Baltimore & Ohio Sheperdstown, W. Va.	1941	Nov., 1968
E. C. Vandenburgh (Ret.)	Chief Engineer Chicago & North Western Winnetka, Ill.	1925	Dec., 1968
LIFE MEMBERS			
J. L. Anderson (Ret.)	Supervisor Bridge & Building Missouri Pacific Prairie Village, Kans.	1931	1968
L. E. Lyon (Ret.)	Principal Assistant Division Engineer Southern Pacific Walnut Creek, Calif.	1947	Nov., 1968
H. C. Madson (Ret.)	Designer Chicago & North Western Hutchinson, Minn.	1940	Oct., 1968

LIFE MEMBERS

O. F. Rowland (Ret.)	Assistant Engineer Delaware & Hudson Canaan, N. Y.	1923	1968
T. M. Von Sprecken (Ret.)	Assistant to Chief Engineer Southern Arlington, Va.	1938	1969
H. O. Wray (Ret.)	Secretary and Chief Engineer Texas City Terminal Texas City, Texas	1939	Nov., 1968

We deeply regret the passing of these, our fellow members. May we stand a moment in silence to honor these departed members.

Respectfully submitted,
C. F. Wachter, *Chairman*

REPORT OF RESOLUTIONS COMMITTEE

Mr. President, at the close of this 74th Annual Convention of the American Railway Bridge & Building Association, the Resolutions Committee offers the following resolutions:

BE IT HEREBY RESOLVED that the thanks of this Association be extended to Mr. Kenneth Hildebrand for his message of spiritual assurance.

BE IT FURTHER RESOLVED that the thanks of the Association be expressed to the several prominent speakers who sacrificed their time and so willingly shared their wisdom and counsel with us, especially AREA Vice President E. Q. Johnson, Chicago and North Western's President L. S. Provo, Penn Central's President A. E. Perlman and Mr. Kenneth L. Lawson of the Department of Transportation.

BE IT ALSO RESOLVED that the Association express its appreciation to REMSA for assembling the exhibition of equipment for our inspection and review, and to REMSA President C. E. Godfrey who, with his fine staff, so generously provided us with a most sumptuous banquet and an evening of entertainment.

BE IT FURTHER RESOLVED that our thanks be expressed to Mrs. C. T. Popma and to Mrs. W. F. Armstrong and their committees for their efforts in arranging registration and entertainment for our wives, and to the untiring efforts of the ladies who assisted in the registration.

AND, BE IT FINALLY RESOLVED that the Association express its thanks to its Chairmen and their committees for their fine work in preparing the reports which were presented at this convention, as well as to the members of our executive committee and to our President Mr. W. F. Armstrong, who has spent so much of his own personal time and effort in guiding the affairs of our Association over the past year.

Mr. President, we recommend these resolutions be made a part of the official record of this Association, and that copies be presented to all concerned parties.

Respectfully submitted,
J. W. DeValle, *Chairman*

USS American Bridge builds

World's Longest Vertical Lift Span

The 71-year-old swing span carrying the Staten Island Rapid Transit Railway over the Arthur Kill between Staten Island, N. Y. and Elizabeth, N. J., has been replaced by a modern lift bridge. And there's an interesting story behind the event. When the 496'6" swing bridge was built in 1888, it was the longest in existence, a record it held for many years. It too, was fabricated and erected by American Bridge.

The imposing new bridge, with its 557'11½" thru truss vertical lift span, is also a record-breaker.

But great length is not the only feature about the new bridge. It is an imposing structure from every angle. Big, but not as heavy as it looks because most of the 1,658 tons of steel in it are USS MAN-TEN; the towers are 33' x 32' in width and 163'4" high; and even the vertical lift span itself is huge, being 43'4" deep at the end and increasing to 70' in the center. The old bridge, incidentally, will also be dismantled by American Bridge.

American Bridge has unmatched experience in railroad bridge construction. We have the know-how, the equipment and the personnel to handle such jobs with a minimum of interruption to traffic. We welcome an opportunity to discuss your bridge replacement or repair requirements. Just call or write the nearest office listed below.

USS and Man-Ten are registered trademarks

American Bridge Division of United States Steel

General Offices: P.O. Box 86, Pittsburgh, Pa.
Contracting Offices in: Ambridge • Atlanta • Bakersfield, Cal. • Baltimore • Boston • Chicago • Cincinnati • Cleveland Detroit • Fresno • Gary • Houston • Los Angeles • Minneapolis • New York • Pittsburgh • Portland, Ore. • St. Louis • South San Francisco • United States Steel International (New York), Inc., Export Distributors

Report of Standing Committee 2

Tools and Equipment for B&B Work

J. W. CHAMBERS, CHAIRMAN
Bridge Construction Engineer, Missouri Pacific

Subcommittee Report

Heavy Equipment for B&B Work

This is the fourth report of your Standing Committee No. 2 on heavy equipment related to cranes and pile driving, primarily. We have given a general report and a report on how various railroads apply their cranes and pile drivers. In the absence of specific requests this year, it was decided to mix the previous reports into a conglomerate. This will be somewhat of a review of our previous papers with some new ideas perhaps for some of you and some old for others. We decided a pictorial review was in order.

Some of the slides some of you may have seen before. Those of you who may have missed one of the last two reports will see some of each, and some entirely new.

Since we are familiar with the self propelled pile driver, we will dispense the item, and move into the many other uses of cranes and their ready adaption for various types of work, i.e., pile driving, boring of holes and handling of materials.

Some of the variations of cranes used in the placement of piling are: a locomotive crane with swinging leads, with hammer enclosed, a crawler crane with spud type leads, a locomotive crane with fixed leads hammer enclosed. Another is a locomotive crane with hammer in the leads and an earth auger attached to side of leads, all of which fold for travel.

Another method of driving piling is of course—as many of you have seen —with a vibrating hammer. There are no leads. They work best on steel sheet, pipe or "H" piling.

Driving is incredibly fast in sandy soils. Absence of leads and length of hammer tends to make driving easier under limited head room conditions. This vibrating hammer will also extract piling and can be doubled up for extremely heavy driving.

Drilling is done by various styles. As previously mentioned, it can be done with an auger attached to the leads, but note that holes are pilot holes only for pipe or wood piling and not heavy drilling. Medium size augers can be attached to 15 ton on-off track truck cranes used in B&B service.

Heavy drilling for large caissons need corresponding heavier machines for large augers and core barrels.

Cranes can be used together or separately very satisfactorily. As was shown in the slides, two cranes handling prestressed pre-cast units. Two off tracks crane renewing old girder to PS & PC removing bent, removing portion of pier, placing PS & PC units.

Locomotive cranes, when available, and working under heavy traffic speed up the work and decrease the length of time to resume normal operations. Removing old truss members, placing PS & PC units, placing units and track panels.

Following slides presented several views of placing paneled track ties and track panels on PS & PC structure. Placing paneled ties on steel structures was shown in another slide as well as

placing paneled ties on turntable, 113# No. 14 switch in two sections. (The beam didn't fail). Placing steel in through Girder, removing section of old pony truss. Placing PS & PC units and placing concrete with truck crane.

Following slides were on drilling only. This is an operation not too frequently encountered by B&B, but often enough, so these provided some ideas.

Short movies were shown and included the following:

1. V-10 Hydraulically powered vibratory driver-extractor.
2. 20-inch series light weight leads with DE10 diesel pile hammer.
3. DA-35 Convertible diesel pile hammer in swing leads.
4. UN OS-60 Offshore pile hammer.

This report was a brief review to indicate the wide range of use that may be received from the equipment at our disposal. We are fortunate indeed that management of our railroads in their attempt to modernize and establish up-to-date work practices are willing to purchase new and more efficient equipment.

Used with reasonable care, maintained regularly, adhering to safety precautions, this new and modern equipment should give years of faithful service.

Subcommittee Report

Portable Power Tools for B&B Work

In 1966 your committee reported on small tools in general and made various comments on their use. In 1967, we reported specifically on electric power tools and in 1968, air tools. Advantages and disadvantages were weighed and discussed without dictating conclusions. Any attempt to declare one type of tool as best for B&B work would be foolhardy since anyone here could immediately disprove this.

This year your committee reports on hydraulic tools. They are relatively new compared to pneumatic and electric tools and are not in as common usage on railroads yet. It would appear, using our expert hindsight, that they would have been a natural development out of the extensive use of hydraulics in machinery that has taken place in the last few years.

They are expensive, but competitive with air tools, and considerably more expensive than an equal electric tool. One reason is certainly the fact that finer tolerances and precision is necessary in their manufacture. The fluid propelling the tool is recirculated and any leaky parts immediately drops pressure required in the tool to the point where it is nearly inoperative; air tools waste their propelling medium and though they also require high precision in the parts a by pass and leaks can generally be tolerated up to a point, since volume of propellant and not high pressure governs more.

In every respect, hydraulic powered tools are a most welcome addition to the power tools used in B&B work. For one thing, as some say, it helps keep the other manufacturers honest. They have good competition from a source they did not expect. The *main* factor in this new line of tools available is that, in addition to the regular tools such as chain saws, wood drills, and impact wrenches, with which we are all familiar, they are unique in the fact that there are tools designed specially for work on timber trestles that are not available in gas, air or electrically operated tools.

This has never happened before in

small tools to us. The common ones mentioned before have uses in many crafts but the special ones are for us. Usage and familiarity can perhaps perfect these more. I hope this happens as our loss would be greater than the manufacturers if they didn't take.

The special tools referred to are the chord and drift bolt pullers, the spike puller, power hacksaws, power bolt cutters, jacks, deck liner and chord mover. Other special tools, but not necessarily bridge tools are the long reach chain saw, tamper, earth auger, circular saw and capstan, all hydraulically powered. They would be useful for other B&B functions.

A few words about each of these tools is in order.

How many times have you seen an employe repeatedly slamming on a claw bar to pull a rust frozen chord bolt, drift pin or anchor bolt for a half hour before the bolt was removed? A hydraulic puller will remove it in seconds. This tool could pay for itself several times over in increased production on one long timber trestle. Throughout the year, on a gang that is doing strictly timber bridge work, there is no estimating the savings involved in increased production. Frequently, the hang-up from rust frozen bolts dictates the speed and progress of the work that follows and is a frustrating adventure.

The spike puller is essentially the same as the bolt puller, but of necessity has a different head fitting and since the power required is less, is smaller, shorter and lighter.

There is a deck liner, deck jack, chord mover, a pad type jack with chain blocks and chain, a jack group with chain block and chain for the ballast and open deck jack beams. These are all essentially jacks, hydraulically powered.

The jack group has a roller type head that allows it to hang from and roll along the beam and also jack against the beam with a chain block holding the jack to a pile. A conversion unit is available to convert the head to the pad type jack head for jacking from a piling directly against a cap or stringer. Depending upon the amount of work being done concurrently on one bridge this conversion can be made. However, it would be necessary to stop one phase of work on long bridges to do another and this is not feasible except on small short maintenance jobs. They have a capacity of 21 tons each. Required in at least a pair.

The deck jack is 8 ton capacity, fits between ties and has 2 lifting brackets, one near the base, one higher, 21 inches apart and used in pairs like track jacks.

The deck liner has a head that fits against rail ball, a base that clamps to tie. This will move rail and ties to line decks instead of the whole gang on bars. Capacity is 5 tons. This also has fittings for chains to pull braces against piling. The chord mover has a rocker base and a head for chains or rail flange. It is chain blocked to the outboard end of a cap to move a chord in and jacked against the opposing rail to move a chord out.

The use of a power bolt cutter is obvious, there are none in gas or electric powered tools. I believe there is an air powered cutter for reinforcing steel which may be used but I am not sure of its capacity—if it will cut bolts to 7/8".

The power hack saw has blades long enough for our use. I know of no electric hack saw blade long enough. An adapter can be made so that an electric hack saw is usable but you have to invent your own.

All the other tools mentioned previously, while not specifically for bridge work, could fit very well into a gang that does all varieties of B&B work. The tamper, earth auger and circular saw all have their place. Last but not least is the powered capstan, an interesting little item that chain blocks to a post, pile or gin pok for hoisting. Immediately, the thought comes to

mind perhaps it could be used to pull strayed piling under caps for cutoff.

All of the hydraulic tools are efficient, smooth starting, and powerful due to the high working pressures. There is the fact that because of this, maintenance of a higher order is necessary. However, I find most foremen are eager to make a showing in their work and if they get tools that will do this, they will keep them in working order to the best of their ability. Clean fluid and tight parts and lines will accomplish this.

A B&B gang can handle most of what confronts it with the tools offered in this line, and more, as has been mentioned there are tools that are not available in other types.

To sum up—it is no longer a question of convincing oneself and management that power tools are labor saving devices by virtue of increased production for the same amount of men. This now is a well established fact, and more important than ever before with higher labor costs and frozen jobs. Our management will be concerned, and will have to be continually convinced that the tools are properly deployed and efficiently utilized.

This is no small accomplishment. A supervisor with his mind fixed on one type of tool immediately limits and restricts the amount of work his men can do. As mentioned in a previous report, you can take along a hot plate and make coffee, with the generator for electric tools, but there are no electric tools that break concrete, pull drifts, or saw piles under water.

Furthermore, many gangs are small now, some by choice and some by necessity and some because of inability to get the men. Also, power tools may be limited by economic reasons or personal prejudice to too few, or one kind, or both. Combining all these factors, deployment of men and tools becomes a real task.

All this tends to convince one more and more that it is false economy to limit gangs to one type of tool. Many times a foreman of a 5 to 7 man gang has a 2 man job nearby an existing job. Perhaps 2 or 3 of these jobs nearby. If all he has is a large air compressor or an air tool it will take the entire gang to get these jobs done. On the other hand if he also has electric tools and a small generator, or hydraulic tools and a small pump he can send a couple of men away from a central job to do these small chores.

Air is required to cut and back out rivets in a steel bridge, but you can replace those rivets with high strength bolts and use either an air, electric or hydraulic impact wrench.

Newly placed concrete can be vibrated with any of the three types of vibrators, but there are only air tools to chip or break up the old concrete.

All of this merely points up the fact that to achieve proper utilization and efficiency that a lot of flexibility is needed, and by flexibility we mean the ability to pick up and go with minimum effort, with 2 men or 10, and get the job done with the proper tools and not have power tools for one phase and have to hand work another phase. Any hand work immediately nullifies much of the gain made by a power tool. Hand work could control progress of an entire job with the result that a power tool at another phase is only performing one of its functions, that of making the work easier and not increasing production on the project.

Maximum flexibility coupled with maximum utilization leads to maximum efficiency. One type of power tool will not do this. A variety is necessary using them together and separately. Certainly, the addition of the hydraulic power tools is a large step towards this goal.

Special Feature

Inspection of Structures

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One subject that is assuming more importance every day to members of the American Railway Bridge and Building Association is the inspection of our bridges and structures.

Inspection involves a thorough, minute, searching hunt for all of the defects which can occur, made by a qualified inspector who knows what he is looking for, where to look for it, and has sufficient judgment to realize its importance after he has located it.

A large part of our structures was built shortly after the turn of the century. They were designed for much lighter cars and engines, travelling at slower speeds than modern trains. There was a considerable amount of extra strength provided in these bridges, or we would today be faced with massive strengthening and rebuilding programs.

Naturally, the heavier equipment we are using causes higher stresses in our structures, and we must be alert to see that no conditions develop which will develop into hazards affecting the safety of our operations. No laxness in inspection can be tolerated. Accidents don't just happen—they can usually be traced to someone's negligence or failure.

The benefits to be gained from proper inspections are many and varied. They include fewer derailments, reduction in operating hazards, fewer emergencies from failures of materials which should have been removed earlier, reduction of maintenance expense, and a better planned maintenance program, as well as the confident feeling of a job well done.

Most modern railroads today have detailed forms for use by the inspector which serve to remind him of many details of each culvert, tunnel, bridge, or trestle when he makes his inspection. These forms are valuable in making periodic inspections, and should be retained in a central location for comparison with subsequent reports. It is very helpful to a young Bridge Supervisor to learn that a minor defect he has recently discovered during his first trip over his territory was found by the previous supervisor, who had known about it for a long time and had it under observation. These forms also help to train us not to overlook many of the vital points which are so easy to forget. If your railroad does not have these forms, contact one of your friends from another railroad, ask them to let you borrow one of their forms, and copy or adapt it to your needs.

Turning from a general discussion of inspection to a specific reminder of some of the defects you should check, I would like to remind you of the following:

• Track line and surface are vitally important, especially at the ends of the structure. We have far too many defects in this regard, and must increase our efforts to eliminate them. Bad approach conditions will result in surface-bent rail, excessive rail joint stresses, excessive plate cutting on end bridge ties, and if permitted to deteriorate far enough may even cause derailments. It is not enough merely to note that poor conditions exist at the time of the inspection—your duty is to discover *why* such conditions exist, and

to *see* that they are fixed. For instance, is the approach ballast scant, or is drainage poor, or are track ties spike killed or split? Why is the ballast scant —do the shoulders require flushing, or do the wing or retaining walls need repairs? Look beyond the immediate effect for the cause, and *fix it*.

• The costs of labor and material for bridge tie installation are growing by leaps and bounds. We must pay particular attention to conditions of existing decks in order to "milk" out as long life as possible. In an effort to obtain best results, we are using larger tie plates, self sealing tie pads, deck coating and sealout material—we must not throw away these benefits by careless or inadequate inspection. See that drift or hook bolts are in place and are tight—a loose hook bolt is worthless.

• Ballast deck trestles are ordinarily quite stable as to maintenance of track line and surface. One of the most common faults of these structures, however, is spreading of the stringers, with resulting loss of ballast. This may usually be noted first on the ground under the structure, and after progressing further will affect the track structure above. You should have the full cooperation of the Assistant Supervisor, who is responsible for daily track inspection, in reporting any suspicious looking conditions, but you must not depend on him to do your job for you in this respect.

• Timber stringers in open deck structures are relatively easy to inspect for sloping grain, horizontal or vertical cracks, or end crushing, but ballast deck stringers present a more difficult problem. The most satisfactory results will be obtained by drilling these members near the bents with a small power drill and examining the chips. Such drilling may reveal presence of hollow or rotten stringer ends, or may reveal sound lumber adequate for more years of life.

• Timber caps require especially close and intelligent inspection because of the many and varied conditions they have to withstand. Open deck trestles driven in the past without shifting of stringers are frequently found to have caps spanning between piles spaced as much as four feet apart. Frequently interior piles are unstable, churning under traffic, and subjecting the caps to excessive deflection and early failure. Check these caps for signs of bulging sides, presence of green algae or growth indicating trapped moisture and incipient dry rot, poorly framed posts or piles which do not fully contact the cap, horizontal splitting and checking, crushing of the cap fibers immediately above the piles, and hollow ends. Sound the timber by striking with a hammer—this may reveal presence of decay or hollow spaces within.

• In general, framed post bents are more apt to be sound than older pile bents because of the difference in their ages. Each, however, has its peculiarities and weaknesses. Improperly driven piles may begin to churn, or to settle under load, so much so that a gap or space may appear under the cap. An overdriven pile may have a hidden split, or a broomed tip. In pulling piles to proper alignment after driving, there is a strong possibility that severe bending stresses might be introduced which would weaken the bent. By comparison, a framed bent might have improperly cut members which do not share the load equally, or might have improper bevels cut in the post ends, causing a gouging action in the cap. These are not rare or unusual conditions but rather the result of a combination of poor workmanship and equally poor supervision.

Steel bridge inspection is generally a simpler procedure than that of timber trestles. Structures fabricated from steel are more uniform, and are manufactured to closer tolerances, and therefore their action is easier to predict. It is not absolutely necessary to understand the design of a truss to properly inspect it, although such an understanding certainly would be an advantage.

As a general rule, you should train yourself to look for defects by following the path of the load through the structure. The closer the member is to the source of the loading, the more apt it will be to give trouble.

A series of slides illustrating certain features of steel bridges were shown. The bridges were not identified as to owner, but were probably typical of many now in existence. Slide No. 1 indicated a view of a deck and lower chord of a through truss.

• Bridge ties should be carefully inspected for plate cutting, loose spikes, rail alignment and surface, loose tie plates, checking and splitting as well as whether or not hook bolts are tight. Coating the ties shown in Slide 1 would probably extend their life as well as effectively fireproof them. The eyebars shown in the bottom chord are subject to wear at the pin connections. This results in uneven tightness which can be corrected by flame heating and shortening one or more of the bars. To detect looseness in the bars, shake them vigorously and watch for non-uniform vibration or slap at the ends.

• Slide No. 2 indicated a stringer connection to a floorbeam. It is not uncommon for cracks to start in the fillet or corner of the connection angle at the top, and progress downward along the fillet. In such a case, the end connection angle must be replaced to restore the original capacity of the stringer.

• Slide No. 3 showed a view of connection of a floorbeam to a vertical truss member. Deflection of the floorbeam will distort the flanges of the vertical member and encourage cracks to form at the upper rivets. This result is most common at hip hangers, or the first vertical member adjacent to the ends of the truss. In hip hangers, the cracks are usually found in the vicinity of the lowest rivets in the gusset plates connecting the hangers to the top chords.

• Slide No. 3 showed a view of the of a top chord joint of a through truss. The large nut which secures the pin connecting the chord and vertical should be tack-welded to the pin, or prevented from loss by burring the threads of the pin. The transverse bracing should be checked for cracks particularly at the end connections where vibration stresses are most severe.

• Slide No. 5 illustrated how a roller nest under a truss end post can become skewed, and reduce the ability of the truss bottom chord to expand under load. This changes the stresses in the truss and possibly overloads some of the members when they are working near maximum capacity. In such a case, the truss should be jacked and the rollers straightened to restore freedom of action. The pier tops should be clean and free of debris as is shown in this slide. Sand or rocks will retain moisture and promote rusting, while paper, fragments of wood, or drift, constitute a severe fire hazard.

• Slide No. 6 viewed viaduct towers which support deck plate girders. The tower legs should be inspected for evidence of settlement or leaning out of plumb. Column base plates should be checked for corrosion, condition of anchor bolts, damage to masonry under the plates or pumping under load. Needless to say, the presence of undergrowth and vines leading up the tower leg to the deck are a source of hazard from fire.

• Slide No. 7 indicated the end bearings of a deck plate girder. In this case, timber has been placed under the bearing and protected from the elements by a metal cover. Many roads find this practice of cushioning end bearings to be beneficial in reducing impact at this important point, and extending the life of the bridge and track ties as well as the rail. The vegetation in this slide should be cleared away to minimize risk of fire.

We cannot be too careful in our daily inspection activities. Attention to details may seem burdensome and time-consuming, but will pay dividends in safety and cost reduction in the long run. Your interest and close inspection must be continued without letup.

Report of Special Committee No. 1

Concrete Trestle Ties— Their Manufacture and Installation

A. C. JONES, JR., CHAIRMAN
Process Engineer—Structures, Southern

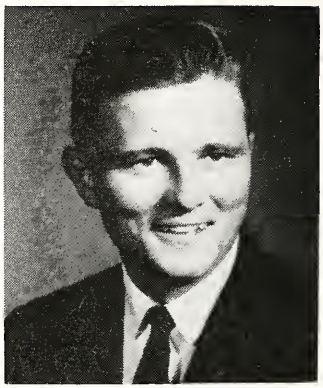
With the advent of heavy unit trains and with the increased number of axles weighing in excess of 65,000 pounds, preparation for the sharp increases of these heavier loads on our structures became essential to the continued safe operation of our railroads.

Throughout the nation, the extent of timber trestles is far greater than that of steel, concrete, etc., and the need for repair or replacement of the timber components of these timber trestles is more critical.

It is a considered opinion that the most vulnerable components of a timber trestle are the caps and the ties because of high wheel loadings being exerted in cross-grain bearing. Because of this, the concept of the concrete trestle tie was born.

One of the concrete trestle ties presently on the market has the following characteristics: Length—10 ft, depth—7½ in, width—9½ in and weight —740 lb. The ties are installed on 16½-in centers. Into each tie is cast eight insert holes, four under each rail area, which measure 2¼ in long parallel with the tie and 1½ in wide. The depth of the insert is 5½ in and there is a ¾ in drain hole at the bottom of each insert hole.

Into each insert hole is placed a gum or oak block, soaked to refusal in pentachlorophenol solution, which measures 2 3/16 in wide and 5¼ in deep. The insert plugs fit snugly in a direction parallel to the reinforcing cables but have a ⅛ in tolerance transversely to permit expansion of the insert during the spike-driving operation.



A. C. Jones

Come with us now to the plant of Shelby Pre-Casting Corp. in Memphis, Tenn., for a closer look at how these ties are made. At this plant, the ties are cast in the long-line method, end to end, on a casting bed that measures 378 ft. There are 36 forms, each ten feet long and forming two ties, side by side; the daily production is 72 ties.

The production cycle starts each day after test cylinders have been tested to determine that the compressive strength of the concrete poured on the previous day is at least 4,500 psi. Having done this, the curing covers are removed and the side forms sprung open to allow easy removal of the casting. Reinforcing strands are cut with propane torches and to minimize move-

This report served as commentary on the sound track of a color moving picture presented during the convention.

ment of the casting in the forms, two torches are used starting at each end working toward the middle of the bed until all the strands are cut flush with the end of the tie.

The ties are removed from the forms with an Austin–Western cherry picker lifting the two tandem ties at once and placing them on a trailer. The trailer is equipped with two timber frames which cube the ties into two bundles, one having 32 ties and the other having 40 ties.

As soon as the first ties have been removed from the forms, cleaning and oiling of the forms is begun and is completed soon after the stripping operation. With the forms cleaned and oiled, a crew follows, repositioning the side forms, which is the exact reverse of the stripping operation. The screw studs on the side forms move the sides back into a vertical position. Care is exercised to assure accuracy in the vertical position to within $\frac{1}{16}$ in by an automatic stop on the screw studs. Each tie is cast on its side to insure that the depth of the tie remains true. Depth of the tie is critical because of crushing under load if the sides of the tie are uneven.

Bundles of continuous spiral reinforcing are laid on a sled inside the forms at one end of the bed and four strands are threaded through the spirals and attached to a pulling arm mounted on a truck. The truck then pulls four strands down the bed at once while two men drop bundles of spirals off the sled as they go. The spirals must be cut for installation in each tie. This is made easier by a red mark on the spiral turn to be cut, eliminating the necessity of counting the turns.

After the strands and spirals have been laid in the forms, the strands are tensioned. They are tensioned by a 15-ton hydraulic jack and pump unit with a 12-in gauge, incremented for each 200 lb of pull. Each strand is tensioned to 16,000 lb. The elongation of each strand under this tension is approximately 24⅜ in. The strands are anchored to the abutments by special gripping devices which bear against a steel template.

After the side forms are positioned, the spirals are tied with wires to the strands at the top two corners to prevent movement during the concrete pouring operation.

The next step is the installation of the bulkheads. The end bulkheads are steel plates, ¼ in thick and split in half so that they may be slipped around the strands after the strands have been tensioned. At the same time, the ⅞-in round pins that form the driftbolt holes and the mandrels which form the slot for the wood plugs are installed. The mandrels are made of machined steel to exact dimensions. Each has a $\frac{13}{16}$-in round hole through the center, through which is passed a ¾-in steel rod to a hole in the side of the form on the opposite side. The side of the form which receives the mandrel has been punched exactly to the dimensions of the mandrel. A collar on the back side of the mandrel bears against the form and allows the mandrel to penetrate the form only to the proper depth. The steel pin running through the center of the mandrel, then positions the whole assembly in the form. This pin also forms the drainage hole on the underside of the tie. Finally, removable chamfer forms are placed at each bulkhead.

The forms are now ready for concrete. The concrete is mixed in a central mixing plant and conveyed to the forms in dumpcrete trucks. The concrete is made with 7½ sacks of Type I cement per cubic yard and ¾-in maximum size washed river gravel. The slump is 2 in to 2½ in. The concrete is vibrated internally with an electric vibrator with a 1½-in head.

Following the vibration, the top of the forms are screeded flush and a wood float finish is applied. This struck side forms one side of the tie as it appears in the track.

Sometime between one and three hours after the concrete is poured, the

pins and the mandrels are removed. The reason for this waiting time is so that the concrete will obtain its initial set. Of course, the variance of from one to three hours is dependent on the temperature and the relative humidity of the atmosphere. Occasionally, during the winter months, it becomes necessary to use hot water to speed up the initial set of the concrete.

After the removal of the pins and mandrels, the forms are covered with canvas tarpaulins and live steam is introduced through perforated steel pipes installed underneath the forms. The temperature under the tarpaulins is gradually raised to 150 deg F and maintained there until the required compressive strength has been achieved. This takes from 8 to 12 hours.

When the ties are ready to be stripped from the forms, the same procedure is followed as mentioned earlier, namely, pulling the ties from the forms, loading them on a trailer, cubing them into two bundles and afterwards pulling them to a storage area next to the rail siding by means of a tractor.

The ties are loaded, as needed, into railway gondola cars by a 35-ton crane, in lots of 144/car. The ties are secured to the cars by steel strapping pulled tightly across each bundle.

The installation of the concrete tie is basically the same as for a timber tie, using the "over and under" method. Care must be taken in welded rail territory so as not to cripple the track structure by taking out too many ties at one time. Through field experience, we have found that no more than nineteen ties should be removed at one time.

The wood inserts are placed in the holes and as soon as the old ties have been removed, the new ties are placed under the rail, two or three at a time, and are brought to final position so that the rail is directly between the four insert holes. Next, a tie pad, made of second-hand conveyor belting, ⅜ in to ½ in thick and ¼ in less in length and width than the tie plate, is put in place under the tie plate and a ⅝-in hole is drilled through the spike hole in the tie plate through the tie pad and into the insert. The reason for this is so that the spike will follow a true straight line when it is driven and not burst the sides of the insert holes.

The timber guard rail is placed on the ties and is held in place by a ¾-in bolt. The rail is jacked down and the ties are spiked so that the head of the spike is free of the base of the rail by approximately ¼ in. This allows the rail to run freely through the tie plate. After final alignment the ties are fastened to the stringers by a ¾-in button-head drift bolt.

Report of Special Committee No. 2

Prefabricated Panels for Bridge Renewals —Practicality and Economics

L. C. HARRIS, CHAIRMAN
Assistant Engineer, Atchison, Topeka & Santa Fe

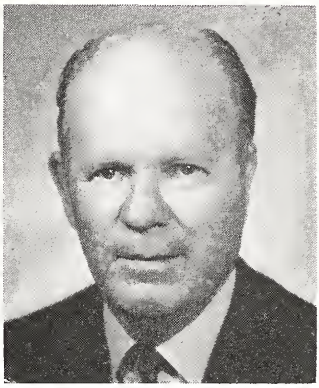
Bridge renewal by the fitting together of panels which have previously been assembled from their individual pieces has many advantages over the customary type of construction involving the fitting or fastening together of the various pieces at their final location. "Prefabricated Panels" are bridge panels, built or assembled away from the structure and lifted, jacked, rolled, or skidded into final location.

The principal purpose of such fabrication is to reduce "on-track" erection-time requirements. The procedure for renewing bridges with prefabricated panel-type construction is much the same as conventional type construction with the exception that more planning and organizing is required to get the panels assembled and positioned in such a manner that they may be set into final location in proper sequence. Procedure and methods vary and must be adjusted to meet existing conditions and to utilize the type equipment available. Care must be taken to assure that equipment capable of handling the panels is available.

As with all bridge work, safety is of the FIRST importance. This is possibly even more important with panel-type construction as the equipment handling the panels is operating at more nearly its maximum capacity than is the case where individual pieces are handled separately.

TIMBER BRIDGES

For timber bridges a prefabricated panel is a complete section of decking (usually one span length) with all the individual pieces fastened together. This fastening together of individual pieces is usually accomplished near the bridge site so that a crane can lift the panels into final position from a stock pile. However, it would be possible to assemble the panels in a shop and ship them to the job site. Most railroads fabricate the deck panels at the job site, and stack the panels on top of each other in reverse of the order they are to be placed in the bridge.



L. C. Harris

One of the principal advantages of this type construction is that all of the prefabrication of panels can be done before the old bridge is opened to permit driving piles. This reduces the time that a slow order will have to be in effect. The bents must be lined accurately to plan location if the panels are constructed prior to opening of the old bridge to insure a proper fit.

In some cases a deck panel can be combined with a panel of stringers or

beams, either timber, steel beams, or secondhand rail, and the whole unit placed at one time. One obvious problem with stringer panels is the necessary lacing together of the stringers when all of the stringers do not butt together on a bent. For structural integrity, most trestles have stringers two panels in length with alternate stringers butting together on each bent, and alternate stringers at each end of the bridge of a single panel length.

DETAIL OF PANELS FOR TIMBER BRIDGES

Most timber bridges have spans in the neighborhood of 14 ft. One railroad uses secondhand 131-lb. rail, six under each running rail for a total of twelve as stringers. Deck panels consist of 3-in by 10-in or 4-in by 8-in deck boards attached to two ballast curbs 6 in by 8 in by 14 ft with drive spikes. Such a panel weighs roughly 2800 lb.

Some railroads do not butt all stringers together on the same bent. In order to lace T-Rail stringers so that alternate rails butt on a bent it is necessary for at least one end of the stringer panel to be held together temporarily by bolts suspended from a timber. The other end can be held in any manner desired as it is not necessary to lace this end with stringers previously placed. In some cases a deck panel can be combined with a panel of stringers, i.e., one span length of decking attached to ½ of the stringers two panels in length. Placing these is somewhat of a problem in getting the stringers which are under the deck panel to mesh properly with the exposed stringers previously set. Obviously, it is necessary to place the last deck panel separately with this method. In the case of open-deck bridges, ties are fastened to the stringers the same as in conventional type construction. Steel beams have the ties fastened with hook bolts whereas timber stringers have the ties bolted to them. About 40% of the ties are fastened.

None of the railroads responding had any experience with the running rail fastened to timber or T-Rail trestle panels. It is doubtful if this would be practical due to the differences between standard panel lengths and rail lengths. In opening up an old ballast-deck bridge it is, in many cases, advantageous to even the joints of the rail and remove the rail panels completely from the bridge to permit removal of the ballast by machine. The track panels can then be replaced either on the bare deck or on the required thickness of temporary blocking and further opening progressed as required for the pile-driving operation. Panelization of sidewalks and handrails can be done but there is little, if any, economy over conventional construction. These items are not critical for traffic and the savings in occupied track time are of minor consequence.

EQUIPMENT REQUIRED

One crane is of course essential for handling the panels. Other equipment much the same as for conventional construction is required. The use of power tools, air or electric, greatly speeds up the process of removing the old bridge and placing the new one. As this is the primary reason for panelization the use of power tools is practically mandatory to justify this type of construction. Most railroads use one large crane, a small crane, winch truck, air compressor and air tools, and the usual complement of small hand tools for this work. As with most other bridge work the method of construction is adjusted to meet the local conditions and utilize whatever equipment is available. The usual practice is to employ two small bridge gangs or one large gang in renewing a bridge with prefabricated panels.

TIME REQUIRED FOR PANEL INSTALLATION

Time required for various panel work is as follows:

(1) Remove track panels so that bal-

last may be removed to permit opening of bridge preparatory to driving piles—10 min per track panel. Usually enough panels are removed on each side of the bridge to permit ramps to be dozed down to the bridge deck or the track panels are set on temporary blocking of the required thickness after the ballast is removed. Grading a ramp in the approaches eliminates the need for blocking under the track and this is especially advantageous on the longer bridges and where greater depths of ballast would require an excessive depth of blocking.

(2) After removal of the track a dozer can remove the ballast from a bridge deck at the rate of 12 minutes per 14-ft panel. The track panels can then be replaced taking about 10 minutes per 39-ft track panel.

(3) The old structure can now be opened up to permit pile driving and bent construction.

(4) After the new bents are completed the placing of the panels can be started. This is accomplished by removing the track panels on a section of the bridge; placing the stringer panels and deck panels; and replacing the track panels. Average time required for this operation should be approximately as follows:

Ten minutes for crane to remove each 39-ft track panel required to be removed. Five minutes for crane to remove the old chords (one under each rail). Fifteen minutes for crane to place each stringer panel required to fill the gap left by removal of the chords.

Twenty minutes for crane to place each deck panel. Ten minutes for crane to place each track panel previously removed.

Fourteen minutes per panel for bridge gang to prepare bridge for traffic. If on-track equipment is used, it may be headed for a siding during this operation.

Generally the necessary track panels to place two 14-ft panels of bridge, can be removed, the stringer and deck panels placed, the track panels replaced, and the bridge made ready for traffic over this 28-ft section of bridge in a two-hour period. This, of course, varies widely with local conditions, men available, and the equipment available for use; however, the above times are sufficiently accurate for estimating the time that the track will be out of service.

COST COMPARISON

It is difficult to reach a definite conclusion in regard to the economies to be realized with panelization due to the many variables encountered such as local site conditions, men and equipment available, and traffic pattern. Most railroads are in agreement that panelization for trestle bridges construction costs are about the same as with other types of construction. As with all estimates of cost and time, there is no fixed formula that can be used to determine the most economical method of renewing a bridge. Each case must be evaluated and considered on its own individual merits due to the many and complex variables that enter into the cost of bridge renewal.

The primary saving to be realized with panelization is in indirect costs as minimizing train delays, reducing occupied track time and better utilization of equipment. Even these savings are thought to be negligible by some bridge men. However, there does seem to be a reduction in train delays and occupied track time, especially where traffic is heavy giving very little work time between trains.

ECONOMIC CONCLUSIONS

Each case must be evaluated as follows:

(1) Compare the estimated cost for construction using panelization with the estimated cost using conventional methods of construction.

(2) Estimate the time required for a complete replacement by each

method, and determine the on-track time. A judgment can then be made as to which method is the best to follow, consistent with the on-track time that can be permitted as dictated by traffic conditions.

(3) Compare the time that a slow order will be required for the two types of construction and evaluate the monetary value of the differences in train delay.

(4) Estimate a rental or depreciation value for equipment used with each method.

An analysis of the above estimates should provide enough information to permit a decision to be made as to whether or not to use panelization in a particular case.

STEEL BRIDGES

With steel bridges, the principal problem in handling a prefabricated panel is the weight. A crane or derrick of sufficient lifting capacity is not always available or can not be readily positioned to handle the load. A 50-ft steel beam span with deck may weigh about 40 to 50 tons and can be handled by either off-track or on-track equipment of suitable capacity. However, it appears more economical in most cases to completely assemble the span on falsework alongside its proposed location. The superstructure can then be skidded into place after the old structure is removed. One successful application of this method involving four single-track 50-ft steel-beam spans was skidded into place with winch trucks, one per span, in a total track out-of-service time of five hours. Two hours were required to remove the old bridge before the skidding could commence.

Obviously the above method reduces the slow-order time for the bridge considerably as the new structure can be assembled along side the old structure without the necessity of a slow order. Only a short time is required to prepare the new bridge after it is skidded into place to carry traffic at normal speeds.

The equipment for this type construction is the same as required for regular steel-bridge construction. A crane capable of handling the beams is a necessity for unloading the material either from railroad cars or highway trucks. The usual air tools, impact wrenches, welding equipment and various assortment of hand tools are required for fastening the components together. In addition to this normal equipment, blocking, skids, jacks, skidding mechanism, and rollers are required if the bridge is to be assembled at other than its final location.

COSTS

Panelization cost for steel bridges as compared to constructing the bridge by placing each individual piece in its final location is difficult to determine accurately. Most recent jobs of this type have been underpass structures for various state and city governments. Some railway companies construct falsework, with the governmental agency's contractor actually constructuring the new bridge. Under these circumstances it is presumed that skidding the bridge into place after it is assembled along side its final location is more economical in many cases as that is the method chosen by the contractor when local conditions and site topography will permit. As for the indirect costs such as occupied track time, train delays, etc., the panelization or skidding of a complete bridge into place is definitely advantageous over "in-place" construction. This cannot be estimated accurately but is nevertheless present.

CONCRETE BRIDGES

Normally, concrete bridges cannot be panelized for a complete span due to the excessive weight. A complete span, 30 ft in length, may weigh approximately 42 tons and it is not practical for most railroads to lift and place such a load, particularly if the handling equipment must also move with the

load. Many railroads are avoiding this problem to a certain extent by constructing prestressed concrete box girder spans with either 2 or 4 box girders forming a complete span. These box girders comprise the complete span, i.e., stringer, deck, and ballast curb which is monolithic with the outside girders. Even with this method, dividing the total span weight to be handled into either 2 or 4 lifts, many companies have difficulty in providing a suitable capacity crane. One recent project, involving 28-ft spans with two 20-ton girders comprising each span, required a 100-ton off-track rental crane for unloading and placing the girders. This capacity crane was required due to local site conditions necessitating handling of the girders at 40 ft from the center of crane.

There is no lacing together of stringers with prestressed concrete box-girder spans as the standard designs used are for single beam spans with the girders butting together on each bent. The track structure is installed on the bridge after the concrete girders are placed rather than integrally with them.

EQUIPMENT

The only special equipment required for placing prestressed box girders is a crane capable of handling the loads at the distances required by local site conditions. There appears to be an economic advantage to either constructing a shoofly or building the new prestressed concrete box-girder bridge on an offset alignment as most construction is handled in this manner. However, when a shoofly on offset alignment is not practical, the on-track time required may be estimated on the basis of five minutes for lifting and placing each prestressed concrete box girder. To this estimated time, the time for connecting the track structure and for placing any necessary blocking must be added to arrive at the total on-track time required.

SUMMARY AND CONCLUSIONS

Advantages of bridge renewal by panelization are as follows:

(1) The work of fabricating panels can be accomplished on the ground near the bridge site more safely and economically.

(2) The work of fabricating panels can be accomplished before opening of the old structure, thus reducing the Slow-Order time requirements.

(3) The fabrication of panels can be accomplished with a minimum of interruptions from traffic. Also, when the time comes, the panels can be placed in position more quickly reducing the out-of-service time for the bridge.

Disadvantages are:

(1) More preliminary planning and organization of the work is required.

(2) Heavier equipment for handling of panels is required.

(3) Special attachments, usually "home made," are required for attachment to the panels to permit lifting into place.

ECONOMICAL FOR TIES TOO

There are also economies to be gained in partial renewal of bridges by panelization, i.e., renewing ties on steel spans. For this work, special consideration has to be given to determining the thickness desired for each tie and marking of each tie to permit identification and placement of each tie in its proper place. This method is especially advantageous when the work time between trains is short.

In summation, it appears that panelization for bridge renewals does reduce construction and on-track time. However, many bridge engineers believe this time saving to be quite small and in some cases even non-existent. It is believed that as experience is gained in this type construction, substantial savings can be made, especially in on-track time.

Report of Special Committee No. 3

Communications Between Management, Supervisors and Men

J. C. HOBBS, CHAIRMAN
Engineer—Track and Structures, Richmond, Fredericksburg & Potomac

To begin our review of Communications Between Management, Supervisors and Men, it is necessary that we clarify the definition of the word "communications" as used in this report. Communications is the art or act of conveying thoughts, messages or instructions from one person or group of persons to another person or group of persons. It is a connection or passage of thoughts from one to another. Persons may communicate through many means, usually by verbal conversation or by writing letters, forms, reports or memoranda. It has been suggested that communication is an art and one that is not easily attained by all people. It may be assumed that when one person conveys a thought to another person that both parties have exactly the same thought. This, of course, is not always true; therefore, the communication has failed and a misunderstanding of some degree has occurred. In some cases the misunderstanding could lead to disastrous results. Consider train orders and motor-car lineups for example. We will attempt in this report to establish basic thoughts to assist us in our communications, both with our superiors and with our subordinates in order to improve efficiency and eliminate misunderstandings and their results.

Consideration has been given to the determination of a definition of the positions in railroading that are known as management, supervisors and men. We were unable to establish a definite pattern among all railroads; therefore, we will not attempt to draw a line where management stops and supervisory begins, or where supervisory stops and men begin. Usually, however, management is considered the "upper echelon" of the company and includes the officers and department heads. Some railroads consider the supervisor of bridge and building and like positions as management. Although this is not the case on most railroads it cannot be denied that a supervisor is the manager of his own department and by the same reasoning, a foreman is the manager of the affairs of his gang. Supervisors are always the "go between" or the "middle men" and usually includes everyone down to the foreman. With a few exceptions, men are generally considered to be the foreman and the men in his charge. Regardless of the terminology of the classes, if we consider the supervisor as the middle man, we will have

J. C. Hobbs

a mutual understanding of wording as used in this report.

It is necessary and helpful to use the proper and accepted form of communication; for example, it would not be likely for the president of a company to write to his vice president in meticulous detail telling him how he should manage the affairs of his office. Most likely an informal conversation between the two would provide the necessary communication. This verbal means of communication is used most frequently in the management of a company, to establish a thought or idea. It is then of the utmost importance that some form of written memo, letter or report be prepared after the decisions are made to place the decisions on record without any doubt of their meaning. In many instances these decisions are to be referred to the lower echelons of the organization and the written form can be used to serve not only as a record but also as written communication. It can be established that a verbal discussion is the best means of establishing the basic ideas and that these ideas be followed up in written form to insure clarity. This method is acceptable and desirable through all groups and occupational levels of the organization.

Since we are attempting to establish as far as this report is concerned, that communication is the exchange of thoughts, not just the issuing of orders, we will discuss jointly the types and methods of communications between management and supervisors conversely between supervisors and management. The basic duty of management is to set the goals of the company and see that these goals are met. Management is responsible to the stockholders of the company for directing the organization to such ends that a profit is made. In order for management to make proper decisions he must be well informed. This information comes to him from his supervisors by various forms of communications. The information must be complete and exact and presented in a form that can be readily understood and used by management. The supervisors will determine through investigation, inspection and other approved means the items of work required in the area for which he is responsible. Limiting our thoughts to the maintenance-of-way department and the bridge and building department in particular, it is the responsibility of the supervisors to prepare a detailed program for presentation to management each year. The importance of proper and complete preparation in strict accord with company policy is an utmost necessity in order to obtain either partial or complete approval of the program. It is easy to forget when we are involved in a small part of a large organization that there are other departments and groups who require authorization for their part in the overall program. Management is responsible for the decision as to which programs will be progressed and which will be deferred. For this reason, the more complete, accurate and detailed the program of the B&B supervisor is prepared, the more likely he is to obtain the necessary requirements for his department. This is one of the most important communications the supervisor has with management; however, after the program has been approved it is necessary for the supervisor to keep management informed of the progress of the work, additional requirements, changes in work schedules, ideas for improvement and savings and the results of their safety efforts.

Management must communicate with supervisors regularly to inform them of their desires and requirements. This is normally a well established and much used channel of communication and is usually in the form of budget allocations, manpower allotments and general rules or regulations which are necessary to achieve the goals of management. Depending upon the established policies of management and in most

cases directly related to the size of the company or department, the detail that is included in the instructions from management varies widely. Usually the smaller the organization the larger the requirements for details in planning. As the organization becomes larger it is necessary for management to ignore so much detail and deal with almost straight dollar figures, leaving the detail planning to the supervisors. As organizations combine and grow, more and more detailed responsibility is placed on the "middle man" and he becomes a most important factor in the success or failure of the company.

It is a common complaint that there is too much "red tape" or too many reports required by management and in many instances too many directives and too much detail received by supervisors from management. An efficient management has established an adequate link of communication between supervisors and themselves to allow for recommendations as to methods of changing these communication methods. Communication between management and supervisors is good. Communication between supervisors and management is often poor because it is not properly used. It is the supervisors' duty to assist in improving this link since he is much closer to the source of the problem than management.

It is not often that management deals directly with the men in the field. This link in the chain of communications is filled by supervisory personnel. The supervisor, being the "middle man," must develop the art of efficient communication with both his superiors and subordinates. This is probably the most difficult of all communications to establish because of many factors; the usual difference in the educational levels of the parties, the difference in basic aims and goals, the geographic location gap that must be bridged and the translation and sorting of one group's thoughts into proper form to present to another.

The men will normally consider the supervisor the person from whom they receive their orders and instructions. Unless motivated by the supervisor the men will hesitate to reverse the line of communication and transmit his thoughts, ideas and sometimes problems to their supervisors. The supervisors are responsible for the issuing of instructions as to the work to be done, material and methods to be used, special safety precautions to be observed and other pertinent information. It is a recommended practice for this communication to be verbal and in the form of a discussion, even if a written follow-up is necessary. Discussion creates productive ideas from the men who will perform the job, men with experience, men who know first hand how they think quality, production and safety can be improved. It is the duty of the supervisor to listen to all these comments, weigh each one on its merit and make his final decision based on these comments. The success or failure of a supervisor can hinge on his ability to receive communications from his men rather than only communicate to his men.

Many problems can arise when a supervisor attempts to relay his instructions to his men. The supervisor is thoroughly familiar with the project for which he is responsible. He may have helped plan the job, he has already reviewed the plan and specifications and has working knowledge of the tasks to be performed. The supervisor then instructs his men on the project. It is impossible to tell each man every detail of the overall project; however, it is not uncommon to tell the man too little, not because the supervisor does not want the man to know but because he is so thoroughly familiar with the details he erroneously assumes the men also have this knowledge. Often too little or incomplete instructions are worse than no instructions. Here again there must be developed an understanding of the person to whom you are communicating and be sure that all

persons involved have the same ideas at the conclusion of the communication.

Timing of the communication with men is of utmost importance. It would not be wise or necessary to instruct a B&B laborer in all the work planned for a year, yet it would be unwise to instruct him day to day concerning a project in which he would be involved for a period of several days or weeks. Good judgment must be used to determine proper timing depending on the results that are to be attained.

One form of communication that is important to the man in the field is praise from his supervisor when he has given an outstanding performance of duty. Here the communication could be of completely different form than we have previously discussed, such as an increase in pay or a promotion. This would be communication by action rather than by words.

Men often communicate with their supervisors in this same way by giving of extra effort on the job when they are unable to express themselves in any other way. A supervisor should always be alert for these things and reward these men as well as those who can use proper and effective words.

Adequate and effective communication between supervisor and his men and the men and his supervisor can be a difficult, yet a rewarding challenge to all concerned, and should be made a part of the goal of each railroad.

One of the few instances of direct communication between management and the men is through a good safety program. Here is an opportunity for management to relay directly to the men their thoughts on safety through a safety supervisor or equivalent. Safety is improved and held on high standards not only by safe working conditions and habits but also by high morale among the men. This morale can be improved by properly presenting management's ideas through the safety program. Here too is an excellent opportunity for the men to relay their thoughts directly to management. A safety program can then constitute an important communication link within a company.

We have discussed communications up and down the chain of command as related to the maintenance of way and bridge and building departments. Communication must also have a lateral movement. An efficient bridge-repair project cannot be performed without complete cooperation of the transportation department, a locomotive or car facility cannot be repaired without the assistance of the mechanical department and records cannot be properly kept without the assistance of the accounting department. This lateral communication is the duty and responsibility of all management and supervisors and is of utmost importance in order to achieve an efficient company. Management has normally set up standards for interdepartmental cooperation and communication.

In conclusion, communication between all persons or groups of persons is individuals working together toward the best interest of all and regardless of the form it takes, verbal, written, or by actions or how it is transmitted, face-to-face conversation, by telephone or radio, the communications should be handled with respect and consideration of the parties involved.

Inside Hoosac Tunnel during installation of the Armco Liner Plates are (left to right) G. M. SEELEY, Assistant Engineer, and C. D. PIERCE, Supervisor (both of the Boston and Maine's Bridges and Buildings Department); and D. L. HORTON, Armco Sales Engineer.

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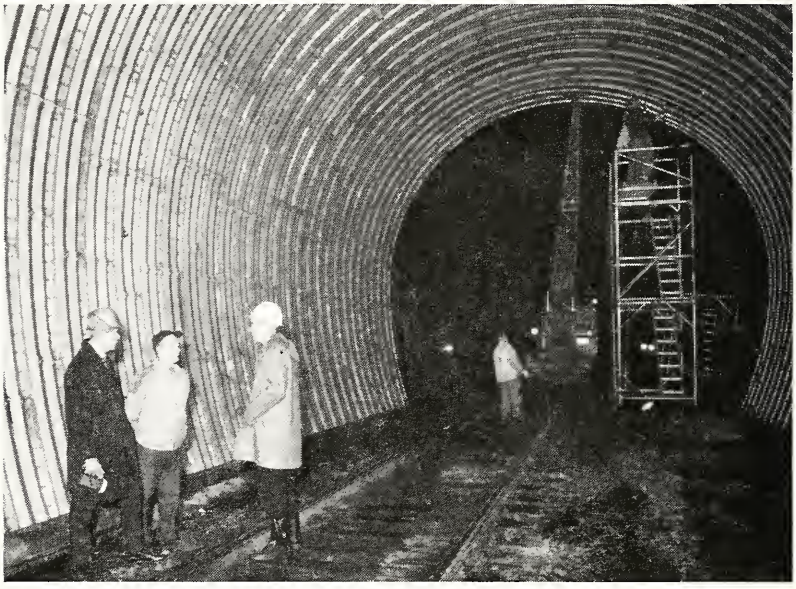

Armco Liner Plates reinforce roof of Hoosac Tunnel.

Armco Liner Plates are being used to reinforce the roof and walls of Hoosac Tunnel and thus retard further spalling of the brick lining. The spalling has been quite costly to owners of Hoosac since the route opened in 1876.

Current owners, the Boston and Maine Corporation, kept about 15 maintenance men constantly busy, mostly at Hoosac's west entrance.

The first Armco Liner Plates were installed in 1963. So far about 700 feet of tunnel have been lined. In the just-completed 328-foot section, 3-gage galvanized plates were pre-bolted together and shipped to the tunnel. On-site plate assembly was thus reduced considerably. The horseshoe-shaped lining is 21 feet 5 inches high and 25 feet 2 inches at its widest point.

Even if your lining needs aren't of this magnitude, Armco Liner Plates will still do the best possible job in saving old structures and making new ones more durable.

Find out what Armco Liner Plates can do for you by writing to Armco Steel Corporation, Metal Products Division, Department M-1089, P. O. Box 800, Middletown, Ohio 45042.

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HISTORICAL INFORMATION

List of Annual Conventions

No.	Place of Meeting	Date	Membership
1	St. Louis, Mo.	Oct. 17–19, 1905	313
2	Cincinnati, Ohio	Sept. 25, 1891	60
3	Philadelphia, Pa.	Oct. 18–19, 1892	112
4	Kansas City, Mo.	Oct. 17–19, 1893	128
5	New Orleans, La	Oct. 16–18, 1894	115
6	Chicago, Ill.	Oct. 15–16, 1895	122
7	Denver, Colo.	Oct. 20–22, 1896	140
8	Richmond, Va.	Oct. 19–21, 1897	127
9	Detroit, Mich.	Oct. 18–19, 1898	148
10	St. Louis, Mo.	Oct. 17–19, 1899	148
11	Atlanta, Ga.	Oct. 16–18, 1900	143
12	Minneapolis, Minn.	Oct. 15–17, 1901	171
13	Quebec, Canada	Oct. 21–23, 1902	195
14	Chicago, Ill.	Oct. 20–22, 1903	223
15	Pittsburgh, Pa.	Oct. 18–20, 1904	293
16	Boston, Mass.	Oct. 16–18, 1906	340
17	Milwaukee, Wis.	Oct. 15–17, 1907	341
18	Washington, D. C.	Oct. 20–22, 1908	368
19	Jacksonville, Fla.	Oct. 19–21, 1909	393
20	Denver, Colo.	Oct. 18–20, 1910	428
21	St. Louis, Mo.	Oct. 17–19, 1911	499
22	Baltimore, Md.	Oct. 15–17, 1912	524
23	Montreal, Quebec	Oct. 21–23, 1913	570
24	Los Angeles, Cal.	Oct. 20–22, 1914	586
25	Detroit, Mich.	Oct. 19–21, 1915	665
26	New Orleans, La.	Oct. 17–19, 1916	710
27	Chicago, Ill.	Oct. 16–18, 1917	704
28	Chicago, Ill.	Oct. 15–17, 1918	716
29	Cleveland, Ohio	Oct. 21–23, 1919	776
30	Atlanta, Ga.	Oct. 26–28, 1920	840
31	New York, N. Y.	Oct. 18–20, 1921	850
32	Cincinnati, Ohio	Oct. 17–19, 1922	865
33	Seattle, Wash.	Oct. 16–18, 1923	846
34	Kansas City, Mo.	Oct. 21–23, 1924	837
35	Buffalo, N. Y.	Oct. 20–22, 1925	759
36	Richmond, Va.	Oct. 12–14, 1926	750
37	Minneapolis, Minn.	Oct. 18–20, 1927	754
38	Boston, Mass.	Oct. 23–25, 1928	755
39	New Orleans, La.	Oct. 15–17, 1929	755
40	Louisville, Ky.	Oct. 21–23, 1930	713
41	Chicago, Ill.	Oct. 16–18, 1934	592
42	Chicago, Ill.	Oct. 15–17, 1935	547
43	Chicago, Ill.	Oct. 20–22, 1936	588
44	Chicago, Ill.	Oct. 19–21, 1937	566
45	Chicago, Ill.	Oct. 18–20, 1938	589
46	Chicago, Ill.	Oct. 17–19, 1939	546

No.	Place of Meeting	Date	Membership
47	Chicago, Ill.	Oct. 15–17, 1940	610
48	Chicago, Ill.	Oct. 14–16, 1941	594
49	Chicago, Ill.	Oct. 20–22, 1942	618
50	Chicago, Ill.	Oct. 20–21, 1943	597
51	Chicago, Ill.	Sept. 17–19, 1946	698
52	Chicago, Ill.	Sept. 16–18, 1947	651
53	Chicago, Ill.	Sept. 20–22, 1948	652
54	Chicago, Ill.	Sept. 12–14, 1949	676
55	Chicago, Ill.	Sept. 18–20, 1950	713
56	Chicago, Ill.	Sept. 17–19, 1951	676
57	Chicago, Ill.	Sept. 15–17, 1952	667
58	Chicago, Ill.	Sept. 15–17, 1953	666
59	Chicago, Ill.	Sept. 13–15, 1954	682
60	Chicago, Ill.	Sept. 19–21, 1955	625
61	Chicago, Ill.	Sept. 18–20, 1956	657
62	Chicago, Ill.	Sept. 23–25, 1957	769
63	Chicago, Ill.	Sept. 15–17, 1958	828
64	Chicago, Ill.	Sept. 15–17, 1959	863
65	Chicago, Ill.	Sept. 19–21, 1960	932
66	Chicago, Ill.	Sept. 18–20, 1961	968
67	Chicago, Ill.	Sept. 10–12, 1962	942
68	Chicago, Ill.	Oct. 14–16, 1963	887
69	Chicago, Ill.	Sept. 14–16, 1964	860
70	Chicago, Ill.	Sept. 13–15, 1965	829
71	Chicago, Ill.	Sept. 26–28, 1966	800
72	Chicago, Ill.	Oct. 11–13, 1967	799
73	Chicago, Ill.	Sept. 9–11, 1968	825
74	Chicago, Ill.	Sept. 9–11, 1969	746

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	G. W. Turner	Floyd Ingram	James H. Travis	J. L. White
	J. E. Wallace	A. S. Markley	J. H. Cummin	A. Shane

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	R. C. Sattley	J. S. Lemond	C. W. Richey	C. W. Richey
	H. Rettinghouse	W. H. Finley	H. H. Eggleston	H. H. Eggleston
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	A. Ridgway	J. S. Robinson	D. C. Zook	J. H. Johnston
	J. S. Robinson	J. P. Wood	A. B. McVay	E. T. Howson
	J. P. Wood	D. C. Zook	J. H. Johnston	C. W. Wright

	1919-1920	1920-1921	1921-1922	1922-1923
President	F. E. Weise	W. F. Strouse	C. R. Knowles	Arthur Ridgway
1st V.-Pres.	W. F. Strouse	C. R. Knowles	A. Ridgway	J. P. Wood
2nd V.-Pres.	C. R. Knowles	A. Ridgway	J. S. Robinson	J. S. Robinson
3rd V.-Pres.	A. Ridgway	J. S. Robinson	J. P. Wood	C. W. Wright
4th V.-Pres.	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.			F. E. Weise	F. E. Weise
	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
	A. B. McVay	A. B. McVay	J. H. Johnston	Maro Johnson
Directors	J. H. Johnston	G. A. Manthey	E. K. Barrett	O. F. Dalstrom
	E. T. Howson	E. T. Howson	F. C. Baluss	S. D. Corey
	C. W. Wright	J. H. Johnston	Maro Johnson	W. B. Hotson
	G. A. Manthey	E. K. Barrett	O. F. Dalstrom	P. N. Nelson

	1923-1924	1924-1925	1925-1926	1926-1927
President	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
1st V.-Pres.	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
2nd V.-Pres.	C. W. Wright	E. T. Howson	F. C. Baluss	Maro Johnson
3rd V.-Pres.	E. T. Howson	F. C. Baluss	Maro Johnson	J. S. Huntoon
4th V.-Pres.	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.	F. E. Weise	F. E. Weise	F. E. Weise	F. E. Weise
	S. T. Corey	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
	W. B. Hotson	A. I. Gauthier	W. B. Hotson	E. L. Sinclair
Directors	P. N. Nelson	E. L. Sinclair	P. N. Nelson	P. F. Dalstrom
	J. S. Huntoon	C. S. Heritage	A. I. Gautheir	W. T. Krausch
	A. I. Gauthier	W. B. Hotson	E. L. Sinclair	R. C. Bardwell
	E. L. Sinclair	P. N. Nelson	O. F. Dalstrom	H. I. Benjamin

	1927-1928	1928-1929	1929-1930	1930-1934
President	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
1st V.-Pres.	Maro Johnson	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
2nd V.-Pres.	J. S. Huntoon	C. S. Heritage	A. I. Gautheir	H. I. Benjamin
3rd V.-Pres.	C. S. Heritage	A. I. Gauthier	H. I. Benjamin	W. T. Krausch
4th V.-Pres.	A. I. Gautheir	H. I. Benjamin	W. T. Krausch	T. H. Strate
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.	F. E. Weise	F. E. Weise		
	W. T. Krausch	R. C. Henderson	G. A. Rodman	E. C. Neville
	R. C. Bardwell	J. S. Ekey	W. A. Batey	H. H. Best
Directors	H. I. Benjamin	T. H. Strate	F. W. Hillman	J. E. King
	R. C. Henderson	G. A. Rodman	E. C. Neville	A. B. Scowden
	T. H. Strate	W. A. Batey	H. H. Best	W. A. Batey
	J. S. Ekey	F. W. Hillman	J. E. King	L. C. Smith

	1934-1935	1935-1936	1936-1937	1937-1938
President	H. I. Benjamin	T. H. Strate	E. C. Neville	C. M. Burpee
1st V.-Pres.	T. H. Strate	E. C. Neville	C. M. Burpee	F. H. Masters
2nd V.-Pres.	E. C. Neville	C. M. Burpee	F. H. Masters	W. S. Lacher
3rd V.-Pres.	A. B. Scowden	F. H. Masters	C. A. J. Richards	C. A. J. Richards
4th V.-Pres.	W. R. Roof	C. A. J. Richards	W. S. Lacher	F. H. Cramer
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Directors	C. M. Burpee	A. L. McCloy	W. R. Roof	B. R. Meyers
	W. A. Batey	R. P. Luck	T. P. Soule	G. S. Crites
	L. C. Smith	H. H. Best	F. H. Cramer	R. E. Dove
	C. A. J. Richards	W. R. Roof	B. R. Meyers	T. P. Soule
	A. L. McCoy	T. P. Soule	G. S. Crites	A. Chinn
	R. P. Luck	F. H. Cramer	R. E. Dove	L. G. Byrd

	1938-1939	1939-1940	1940-1941	1941-1942
President	Armstrong Chinn	A. E. Bechtelheimer	H. M. Church	R. E. Dove
1st V.-Pres.	F. H. Cramer	F. H. Cramer	R. E. Dove	F. H. Soothill
2nd V.-Pres.	A. E. Bechtelheimer	H. M. Church	F. A. Soothill	G. S. Crites
3rd V.-Pres.	H. M. Church	R. E. Dove	G. S. Crites	A. M. Knowles
4th V.-Pres.	R. E. Dove	F. H. Soothill	A. M. Knowles	N. D. Howard
Sec.-Treas.	C. A. Lichty	C. A. Lichty		
Secretary			F. O. Whiteman	A. G. Shaver
Treasurer			F. E. Weise	F. E. Weise
Directors	L. G. Byrd	B. R. Meyers	N. D. Howard	R. E. Caudle
	W. R. Ganser	W. Walkden	L. G. Byrd	I. A. Moore
	F. H. Soothill	A. S. Krefting	K. L. Miner	W. A. Sweet
	B. R. Meyers	A. M. Knowles	R. E. Caudle	J. L. Varker
	W. Walkden	L. G. Byrd	I. A. Moore	L. E. Peyser
	A. S. Krefting	K. L. Miner	W. A. Sweet	Martin Meyer

	1942-1943	1943-1944	1944-1945	1945-1946
President	G. S. Crites	J. L. Varker	J. L. Varker	N. D. Howard
1st V.-Pres.	R. E. Caudle	R. E. Caudle	R. E. Caudle	F. G. Campbell
2nd V.-Pres.	A. M. Knowles	N. D. Howard	N. D. Howard	J. S. Hancock
3rd V.-Pres.	N. D. Howard	F. G. Campbell	F. G. Campbell	E. H. Harnhart
4th V.-Pres.	J. L. Varker	J. S. Hancock	J. S. Hancock	W. F. Martens
Secretary	A. G. Shaver†	Elinor V. Heffern	Elise LaChance	Elise LaChance
	Lorene Kindred‡			
	Elinor V. Heffern			
Treasurer	F. E. Weise	C. R. Knowles	C. R. Knowles	C. R. Knowles
Treasurer Emeritus		F. E. Weise	F. E. Weise	
Directors	M. Meyer	W. F. Martens	W. F. Martens	A. B. Chapman
	L. E. Peyser	A. L. McCloy	A. L. McCloy	W. A. Huckstep
	K. L. Miner	L. C. Winkelhaus	L. C. Winkelhaus	F. R. Spofford
	F. G. Campbell	E. H. Barnhart	E. H. Barnhart	Guy E. Martin
	J. S. Hancock	A. B. Chapman	A. B. Chapman	B. R. Meyers
	L. C. Winkelhaus	L. E. Peyser	L. E. Peyser	L. E. Peyser

†To November 1, 1962 ‡To February 1, 1943

	1946-1947	1947-1948	1948-1949	1949-1950
President	F. G. Campbell	J. S. Hancock	E. H. Barnhart	W. F. Martens
1st V.-Pres.	J. S. Hancock	E. H. Barnhart	W. F. Martens	W. A. Huckstep
2nd V.-Pres.	E. H. Barnhart	W. F. Martens	W. A. Huckstep	Guy E. Martin
3rd V.-Pres.	W. F. Martens	W. A. Huckstep	Guy E. Martin	F. R. Spofford
4th V.-Pres.	W. A. Huckstep	G. E. Martin	F. R. Spofford	Lee Mayfield
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	C. R. Knowles	C. R. Knowles	L. C. Winkelhaus	L. C. Winkelhaus
Directors	Guy E. Martin	H. M. Harlow	Lee Mayfield	H. M. Harlow
	B. R. Meyers	H. B. Christianson	F. M. Misch	V. E. Engman
	L. E. Peyser	F. R. Spofford	W. D. Gibson	G. W. Benson
	H. M. Harlow	Lee Mayfield	H. M. Harlow	F. M. Misch
	H. B. Christianson	Franz M. Misch	V. E. Engman	L. R. Morgan
	F. R. Spofford	W. D. Gibson	G. W. Benson	J. A. Jorlett

	1950-1951	1951-1952	1952-1953	1953-1954
President	W. A. Huckstep	Guy E. Martin	F. R. Spofford	Lee Mayfield
1st V.-Pres.	Guy E. Martin	F. R. Spofford	Lee Mayfield	H. M. Harlow
2nd V.-Pres.	F. R. Spofford	Lee Mayfield	H. M. Harlow	J. A. Jorlett
3rd V.-Pres.	Lee Mayfield	H. M. Harlow	J. A. Jorlett	R. R. Gunderson
4th V.-Pres.	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	F. M. Misch	M. H. Dick	W. H. Huffman	M. H. Dick
	L. R. Morgan	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells
	J. A. Jorlett	J. F. Warrenfells	B. M. Stephens	G. Switzer
	M. H. Dick	W. H. Huffman	M. H. Dick	B. M. Stephens
	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells	W. H. Bunge
	J. F. Warrenfells	B. M. Stephens	G. Switzer	E. R. Schlaf

	1954-1955	1955-1956	1956-1957	1957-1958
President	H. M. Harlow	J. A. Jorlett	R. R. Gunderson	W. H. Huffman
1st V.-Pres.	J. A. Jorlett	R. R. Gunderson	W. H. Huffman	M. H. Dick
2nd V.-Pres.	R. R. Gunderson	W. H. Huffman	M. H. Dick	B. M. Stephens
3rd V.-Pres.	W. H. Huffman	M. H. Dick	B. M. Stephens	H. D. Curie
4th V.-Pres.	M. H. Dick	B. M. Stephens	H. D. Curie	
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	B. M. Stephens	J. F. Warrenfells	W. H. Bunge	G. W. Benson
	W. H. Bunge	H. D. Curie	E. R. Schlaf	J. M. Lowry
	E. R. Schlaf	J. M. Lowry	G. W. Benson	H. A. Matthews
	J. F. Warrenfells	W. H. Bunge	J. M. Lowry	T. M. von Sprecken
	H. D. Curie	E. R. Schlaf	T. M. von Sprecken	W. H. Bunge
	J. M. Lowry	G. W. Benson	H. A. Matthews	E. R. Schlaf

	1958-1959	1959-1960	1960-1961	1961-1962
President	M. H. Dick	B. M. Stephens	H. D. Curie	G. W. Benson
1st V.-Pres.	B. M. Stephens	H. D. Curie	G. W. Benson	J. M. Lowry
2nd V.-Pres.	H. D. Curie	G. W. Benson	J. M. Lowry	E. R. Schlaf
3rd V.-Pres.	G. W. Benson	J. M. Lowry	E. R. Schlaf	H. A. Matthews
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	J. M. Lowry	W. H. Bunge	H. A. Matthews	R. C. Baker
	R. C. Baker	E. R. Schlaf	M. J. Hubbard	R. H. Miller
	W. H. Bunge	H. A. Matthews	R. C. Baker	Shirley White
	E. R. Schlaf	M. J. Hubbard	R. H. Miller	H. M. Wilson
	H. A. Matthews	R. C. Baker	Shirley White	R. D. Hellweg
	M. J. Hubbard	R. H. Miller	H. M. Wilson	F. W. Hutcheson

	1962-1963	1963-1964	1964-1965	1965-1966
President	J. M. Lowry	E. R. Schlaf	R. C. Baker	H. M. Wilson
1st V.-Pres.	E. R. Schlaf	R. C. Baker	H. M. Wilson	R. D. Hellweg
2nd V.-Pres.	H. A. Matthews	Shirley White	R. D. Hellweg	J. W. DeValle
3rd V.-Pres.	R. C. Baker	H. M. Wilson	J. W. DeValle	W. F. Armstrong
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	L. C. Winkelhaus	E. F. Snyder	E. F. Snyder	E. F. Snyder
Directors	Shirley White	R. D. Hellweg	W. F. Armstrong	J. A. Goforth
	H. M. Wilson	F. W. Hutcheson	J. S. Ellis	E. R. Simmons
	R. D. Hellweg	W. F. Armstrong	J. A. Goforth	N. D. Bryant
	F. W. Hutcheson	J. W. DeValle	E. R. Simmons	A. R. Dahlberg
	W. F. Armstrong	J. A. Goforth	N. D. Bryant	J. S. Ellis
	J. W. DeValle	E. R. Simmons	A. R. Dahlberg	T. L. Fuller

	1966-1967	1967-1968	1968-1969
President	R. D. Hellweg	J. W. De Valle	W. F. Armstrong
1st V.-Pres.	J. W. DeValle	W. F. Armstrong	J. A. Goforth
2nd V.-Pres.	W. F. Armstrong	J. A. Goforth	A. R. Dahlberg
3rd V.-Pres.	J. A. Goforth	A. R. Dahlberg	T. L. Fuller
Secretary	Ruth Weggeberg	Ruth Weggeberg	Ruth Weggeberg
Treasurer	W. H. Huffman	W. H. Huffman	W. H. Huffman
Directors	N. D. Bryant	J. S. Ellis	N. F. Lucas
	A. R. Dahlberg	T. L. Fuller	W. L. Short
	H. F. Lucas	R. A. Youngblood	C. E. Wachter
	J. S. Ellis	H. F. Lucas	A. C. Jones
	T. L. Fuller	W. L. Short	W. H. Rankin
	R. A. Youngblood	C. E. Wachter	E. E. Runde
	V. D. Raessler	A. C. Jones	T. A. Reynolds
	W. L. Short	W. H. Rankin	J. J. Ridgeway
	C. E. Wachter	E. E. Runde	J. R. Williams

CONSTITUTION

ARTICLE I.

NAME

Section 1. This association shall be known as the American Railway Bridge & Building Association.

ARTICLE II.

OBJECT

Section 1.** The object of this association shall be the advancement of knowledge pertaining to the design, construction and maintenance of railway bridges, buildings, water service facilities, and other structures, by investigation, reports and discussions.

Section 2. The association shall neither indorse nor recommend any particular devices, trade marks or materials, nor will it be responsible for any opinions expressed in papers, reports or discussion unless the same have received the endorsement of the association in regular session.

ARTICLE III.

MEMBERSHIP

Section 1. The membership of this association shall be divided into five classes, viz: Members, life members, associate, honorary and junior members.*

Section 2.** A member shall be a person in a position above rank of gang foreman in connection with roadway bridge, building and water service work, or in the employ of a public regulatory body, a professor of engineering in a college, an engineering editor, or a government or private timber expert. Any person desirous of becoming a member shall make application upon the form prescribed by the executive committee, setting forth his name, age, residence and practical experience. He shall furnish at least three references to whom he is personally known. Applicants may be voted into membership at any regular executive meeting or by letter ballot of the executive committee, a majority vote being necessary in either instance.

Section 3.** To be eligible for a life membership a member must have belonged to the association for at least 15†† years and in general must have retired from active railway service due to age or physical disability. He shall have all the privileges of active membership, except the holding of office, and shall not be required to pay annual dues. The transfer from membership to life membership shall be made in the same manner as the election of members, as prescribed in Section 2, of this Article.

Section 4. Associates shall be responsible persons who are not eligible as members, whose pursuits or attainments qualify them to co-operate with members in the study and development of improved practices in the construction and maintenance of bridges, buildings and water facilities. They shall have all the rights of members except of voting and holding office. They shall be elected in the manner prescribed for members, in Section 2 of this Article.

Section 5. Honorary members shall be chosen from persons who have attained acknowledged eminence in some branch of engineering or railway service. Their number shall be limited to ten. Honorary members shall be proposed by not less than six active members and shall be elected by the unanimous vote of the members present at a regular meeting. They shall have all the rights of active members except that of holding office and shall be exempt from the payment of dues.

Section 6. A junior member shall be a person who is a graduate of a recognized engineering school, or who has been employed for at least two years in the design, maintenance or construction of railway bridges, buildings or structures. Applicants shall be at least 21 years of age and they shall be elected in the manner prescribed for members, in Section 2 of this article. Juniors shall have all the rights of members

* Amended October 16, 1941.
** Amended September 20, 1948.
†† Amended March 10, 1958.

except that of holding office. When the attainments of a Junior are such as a qualify him as a member, he may apply for promotion and the executive committee shall authorize such promotion when qualifications warrant the action. Unless a Junior is promoted, his membership shall cease automatically when he becomes 28 years of age.*

Section 7. Any member guilty of conduct unbecoming to a railroad officer and a member of this association, or who shall refuse to comply with the rules of this association, shall forfeit his membership on a two-thirds vote of the executive committee.

Section 8. Membership shall continue until written resignation is received by the secretary, unless member has been previously expelled, or dropped for non-payment of dues in accordance with Section 1 of Article VII.

Section 9.** Only active members shall hold office in this association, and only active and life members shall be entitled to vote in the election of officers.

ARTICLE IV.

OFFICERS

Section 1§. The officers of the Association shall be a president, three vice-presidents, a secretary, a treasurer and nine directors, who, with the most recent past president, shall constitute the Executive Committee.

Section 2. The past presidents of this association, previous to the most recent past president, who continue to be members, shall be privileged to attend all meetings of the executive committee, at which meetings they shall receive due notice, and be permitted to discuss all questions and to aid said committee by their advice and counsel; but said past presidents shall not have a right to vote, unless called upon to fill a quorum.

Section 3. Vacancies in any office shall be filled for the unexpired term by the executive committee without delay.

ARTICLE V.

EXECUTIVE COMMITTEE

Section 1.** The executive committee shall manage the affairs of the association and shall have full power to control and regulate all matters not otherwise provided for in the constitution and by-laws and shall exercise general supervision over the financial interests of the association, and make all necessary purchases and contracts required to conduct the general business of the association, but shall not have the power to render the association liable for any debt beyond the amount then in the treasury plus accounts receivable and not subject to other prior liabilities. All appropriations for special purposes must be acted upon at a regular meeting of the association.

Section 2. Meetings of the executive committee may be called by a majority of the members of the committee, providing 10 days' notice is given members by mail.

Section 3. Five members of the executive committee shall constitute a quorum for the transaction of business.

ARTICLE VI.

ELECTION OF OFFICERS AND TENURE OF OFFICE

Section 1. Except as otherwise provided the officers shall be elected at the regular annual meeting of the association and the election shall not be postponed except by unanimous consent of the members present at said annual meeting. The election shall be by ballot, a majority of the votes cast being required for election. Any active member of the association not in arrears for dues shall be eligible for office, but the president shall not be eligible for re-election.

Section 2.§ The president, three vice-presidents, secretary and treasurer shall hold office for one year and the directors for three years, three directors being elected each year. All officers shall retain their office until their successors are elected and installed. A director elected for a three-year term shall not be eligible to serve two consecutive terms.

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* Amended October 16, 1941.

Section 3.† The term of office of the secretary and the treasurer may be terminated at any time by a two-thirds vote of the executive committee. Their compensation shall be fixed by a majority vote of the executive committee.

The secretary shall also serve as secretary of the executive committee.

Section 4. The secretary and the treasurer shall be required to give bond in an amount to be fixed by the executive committee.

ARTICLE VII.

MEMBERSHIP FEE AND DUES

Section 1.† Every member upon joining this association shall pay to the secretary an entrance fee and dues as prescribed by the executive committee. No member in arrears for annual dues shall be entitled to vote at any election and any member more than one year in arrears may be stricken from the list of members at the discretion of the executive committee.

Section 2.‡ A person stricken from the list of members because of non-payment of dues, upon written application may be reinstated as a member in his former class without loss of privileges, either upon payment of all back dues (which must accompany applicants) or at the discretion of the executive committee voting in the manner prescribed in Section 2, Article III.

ARTICLE VIII.*

LOCAL SECTIONS

Section 1.** Upon the application of ten or more members of the association residing in the same geographical district, or having offices therein, the executive committee shall organize a local section for that district, to which all members in that district shall be eligible. Such local section shall admit to active membership only members in good standing. It shall hold not less than two meetings each year, and shall be governed by such constitution and by-laws not inconsistent with the constitution of this association as the section membership may adopt and the executive committee approve.

Section 2. The parent association shall not be put under any obligation, either financial or in the matter of policy or opinion, by any local section.

ARTICLE IX.

AMENDMENTS

Section 1. This constitution may be amended at any regular meeting by a two-thirds vote of the members present, provided that notice of the proposed amendment or amendments has been sent to the members at least 30 days previous to said regular meeting.

** Amended September 20, 1948.
† Amended September 21, 1957.
§ Amended September 28, 1966.

By-Laws

TIME OF MEETING

1.** The regular meeting of this association shall convene annually during the month of September, the exact date to be fixed by the executive committee.

PLACE OF MEETING

2.** The place of holding the annual convention shall be Chicago, Ill.

3. It shall be within the power of the executive committee to change the location or time of the meeting if it becomes apparent that it is for the best interests of the association.

QUORUM

4. At the regular meeting of the association, 15 or more members shall constitute a quorum.

***DUES

5. The annual dues, for the fiscal year ending August 31, and payable in advance, shall be as follows:*
Members, $7.00; Associate Members, $7.00; Junior Members, $5.00.

DUTIES OF OFFICERS

6.† The president shall have general supervision over the affairs of the association. He shall preside at all meetings of the association and of the executive committee; shall appoint all committees not otherwise provided for, and shall be ex-officio member of all committees. He shall with the secretary sign all contracts or other written obligations of the association which have been approved by the executive committee. He shall render a detailed report at least three times during the year to the members of the executive committee, showing the financial condition of the association and its activities.

At the annual meeting the president shall present a report containing a statement of the general conditions of the association.

7. The vice-presidents in order of seniority shall preside at meetings in the absence of the president and discharge his duties in case of a vacancy in his office.

8.† It shall be the duty of the secretary to keep a correct record of the proceedings of all meetings of this association, and of all accounts, between this association and its members; to collect all moneys due the association, and deposit the same in the name of the association. He shall pay all bills when properly certified and approved by the president and the treasurer, and make such reports as may be called for by the executive committee. He shall also perform such other duties as the association may require.

9.‡ The treasurer shall have charge of the funds, check all deposits as made by the secretary, sign all checks after they have been approved by the president, and invest all funds not needed for current expenses as directed by the executive committee. He shall report at each annual meeting on the condition of the finances.

NOMINATING COMMITTEE

10.# After each annual meeting the president shall appoint a committee consisting of five members. Two Past Presidents shall be members of this committee, one of whom shall act as Chairman. No other officers of the Association shall be appointed to this committee. This committee shall prepare a list of names of nominees for officers to be voted on at the next annual convention in accordance with ARTICLE VI of the Constitution, said list to be read at the business session of said convention. Nothing in this section shall be construed to prevent any member making further nominations.

† Amended October 17, 1940.
* Article adopted 1922.
** Amended September 20, 1948.
‡Amended September 21, 1957.
*** Amended September 15, 1965.
# Amended December 4, 1950.

AUDITING COMMITTEE

11.‡ Prior to each annual meeting the president shall appoint a committee of three members, not officers of the association, whose duty it shall be to examine the accounts and vouchers of the secretary and the treasurer and certify as to the correctness of their accounts.

COMMITTEE ON SUBJECTS FOR DISCUSSION

12. After each annual meeting the president shall appoint a committee whose duty it shall be to prepare a list of subjects for investigation to be submitted for approval at the next convention.

COMMITTEE ON INVESTIGATION

13. After the association has adopted the list of subjects for investigation the president for the succeeding year shall appoint the committees who shall prepare the subjects for report and discussion. He may also appoint individual members to prepare reports on special subjects, or to report on any special or particular subject.

PUBLICATION COMMITTEE

14. After each annual meeting the executive committee shall appoint a publication committee consisting of three active members whose duty it shall be to cooperate with the secretary in the issuing of the publications of the association. The assignment of this committee shall be such that at least one member shall have served on the committee during the previous year.

ORDER OF BUSINESS

15.† Call to order by president.
Opening prayer or invocation.
President's address.
Report of secretary.
Report of treasurer.
Appointment of special committees.
Reports of standing committees and presentation of papers.
Unfinished business.
New business.
Election of officers.
Installation of officers.
Adjournment.

DECISIONS

16. The votes of a majority of the members present shall decide any questions, motion or resolution which shall be brought before the association, unless otherwise provided. Unless specifically provided herein otherwise, all discussions shall be governed by Robert's rules of order.

AMENDMENTS

17.† The By-Laws can be amended by a two-thirds vote of those present at any regularly called executive committee meeting.

‡ Adopted October 17, 1940.
† Amended September 20, 1948.

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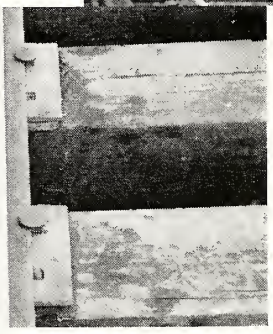

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Note excellent condition of these ties after 9 years' service on railroad bridge spanning the Ohio River at Louisville, Kentucky. 7½" x 10" tie plates were installed with *Bird Self-Sealing Tie Pads* when ties were new in 1948. Vulnerable underplate and spike hole areas are in as good condition today as they were 9 years ago. (Photos courtesy of Kentucky & Indiana Terminal Railroad.)

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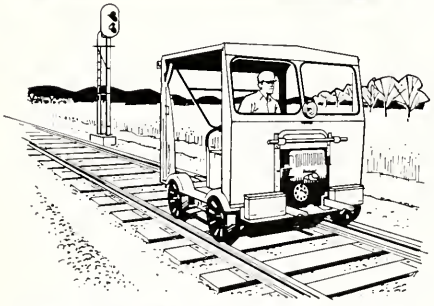

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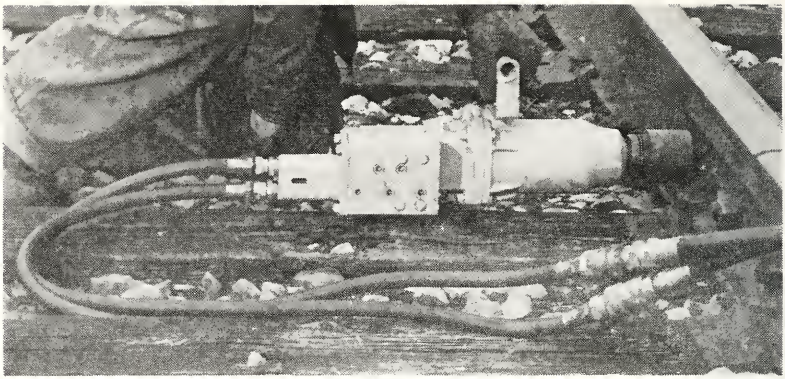

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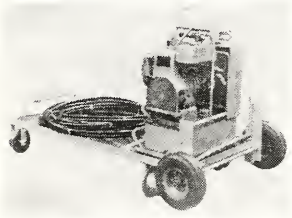

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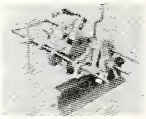

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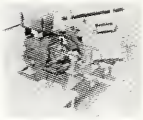

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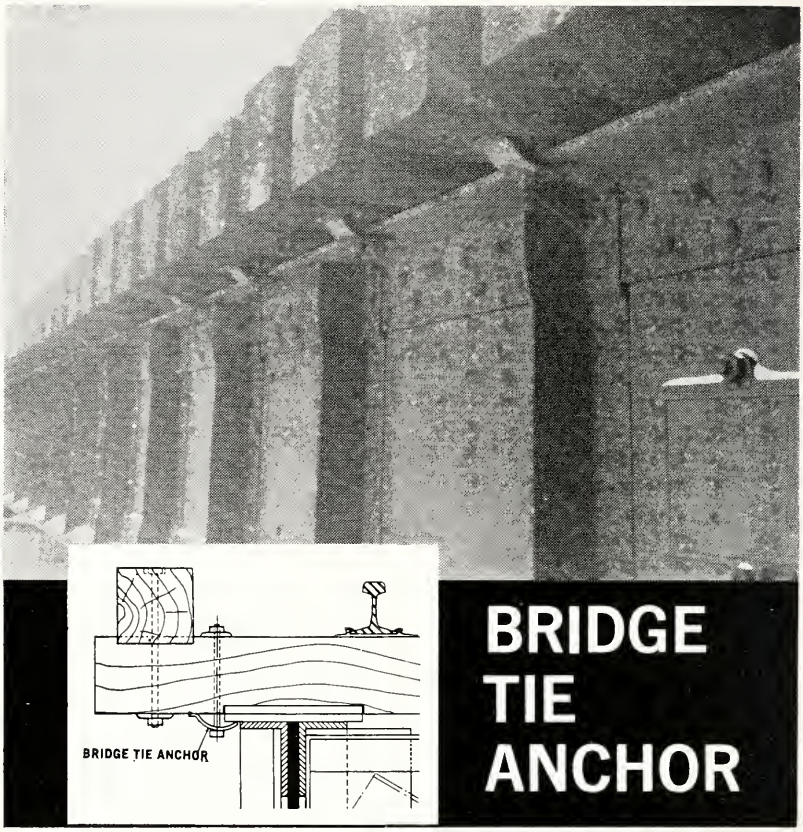

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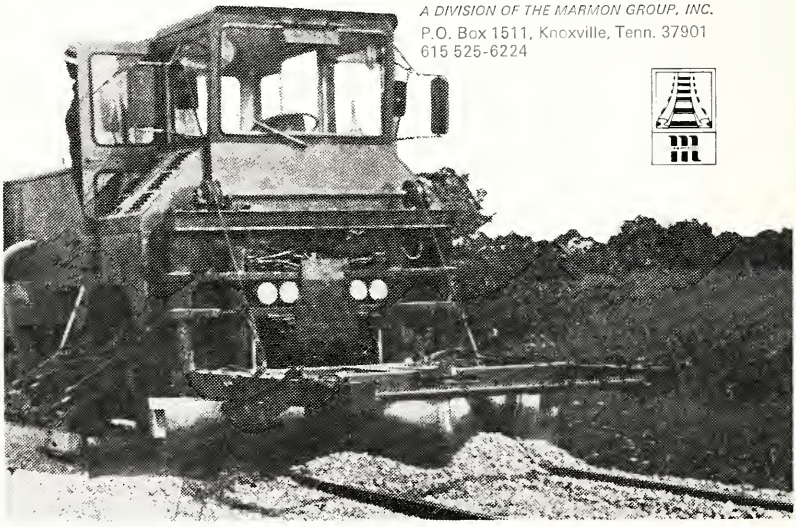

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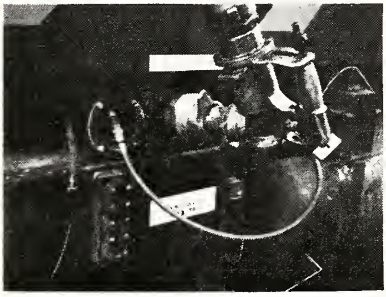
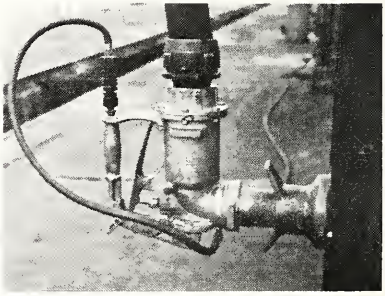


Close-Up of Snyder OPW 1620-DS Automatic Nozzle in operation, with Snyder No. 565 Quarter Turn Fuel Quick Coupling Adapter, connected to Standard Protectoseal Diesel Fuel Tank. Fill Adaptor.



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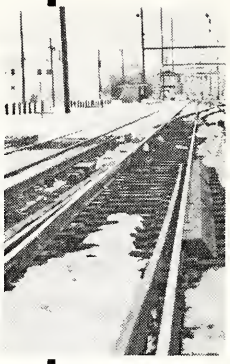

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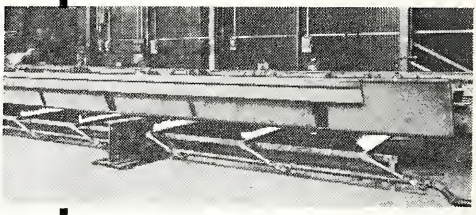

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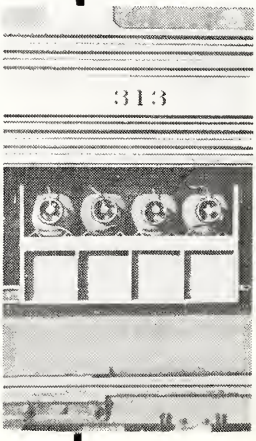

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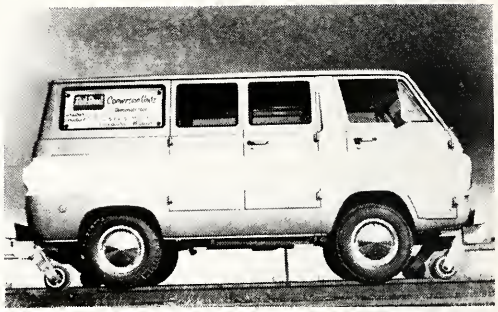

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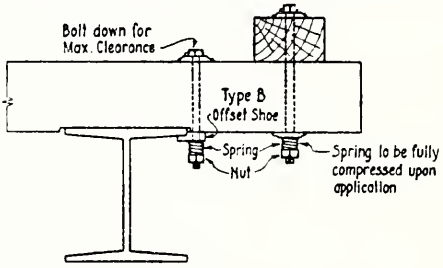

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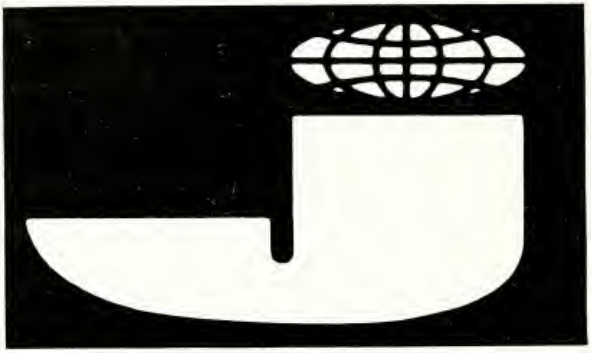

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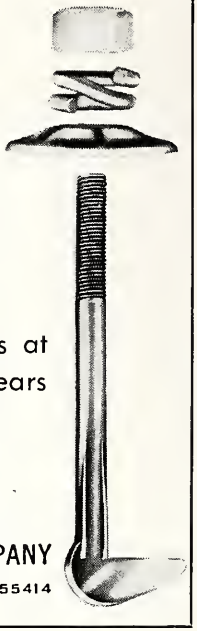

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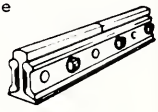

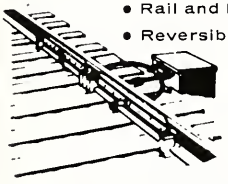

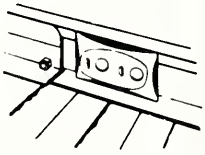

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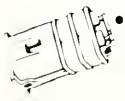

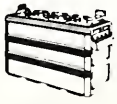

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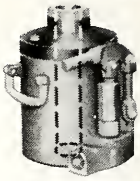

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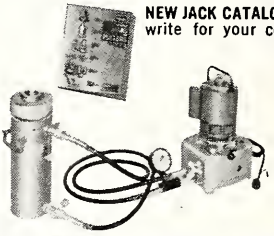

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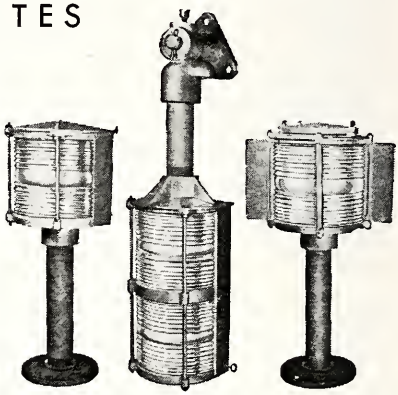

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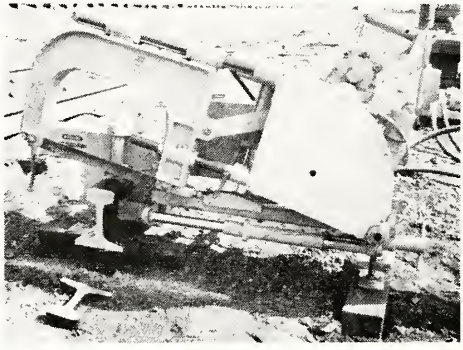

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BIBLIOGRAPHY OF CONTENTS

of Proceedings of

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1948–1969

VOLUME 53 (1948)

Committee Reports:

Eliminating Waste of Water (E. R. Schlaf, Chm)
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Types of Bridges for Replacing Timber Trestles (F. M. Misch, Chm)

VOLUME 54 (1949)

Committee Reports:

Disposal of Liquid Waste at Engine Terminals (J. A. Jorlett, Chm)
Fire Protection for Bridges and Trestles (L. R. Morgan, Chm)
Installation and Maintenance of Built-Up Roofing (W. H. Bunge, Chm)
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Waterproofing on Ballast-Deck Bridges (F. J. A. Leinweber, Chm)

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Committee Reports:

Accident Prevention in Maintenance and Use of Work Equipment (R. L. Fox, Chm)
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Developments in Use of Laminated Timbers (G. W. Benson, Chm)
Effects of 40-Hour Week (F. W. Hutcheson, Chm)
Fire Protection of Bridges, Trestles and Culverts (T. E. Jackson, Chm)
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VOLUME 57 (1952)

Committee Reports:

Developments in Power Tools and Machines (J. T. Hiner, Chm)
Fire Prevention Through Regular Inspections (H. B. Lorence, Chm)
Inspection and Maintenance of Water Tanks (J. H. Stinebaugh, Chm)
Maintenance of Track Scales (C. W. Laird, Chm)
Present Trends in Modernizing Passenger Stations (W. F. Armstrong, Chm)
Repairs to Steel Bridges and Structures (G. W. Benson, Chm)
Restoring and Prolonging Life of Masonry Structures (B. C. Phillips, Chm)
Safety Problems of the Supervisor (G. Switzer, Chm)

VOLUME 58 (1953)

Committee Reports:

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Furnishing Water Under Emergency Conditions (E. R. Schlaf, Chm)
Modern Machines and Power Tools in Bridge Maintenance (J. M. Lowry, Chm)
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Ventilation and Air Conditioning of Railway Buildings (W. H. Bunge, Chm)

VOLUME 59 (1954)

Committee Reports:

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Fireproofing of Timber Bridges (C. E. Elliott, Chm)
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VOLUME 60 (1955)

Committee Reports:

Construction and Maintenance of Roadway Signs (F. W. Hutcheson, Chm)
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VOLUME 61 (1956)

Committee Reports:

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The Slow Order and Bridge Maintenance and Construction (T. M. vonSprecken, Chm)
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VOLUME 62 (1957)

Committee Reports:

Branch Line Bridges and Buildings and Their Maintenance (W. F. Petteys, Chm)
Let the Motto Be Always Safety First (R. D. Hellweg, Chm)
Maintenance of Automotive and Maintenance of Way Equipment (E. F. Garland, Chm)
Mechanization, Tools and Equipment (H. O. Adkins, Chm)
Utilities of Ready-Mixed, Precast and Prestressed Concrete in B&B Work (F. D. Day, Chm)
What Should the Supervisor Expect from Management and Vice Versa? (N. H. Williams, Chm)

VOLUME 63 (1958)

Committee Reports:

Bridge and Building Forces and the Federal Highway Program (M. J. Hubbard, Chm)
Dieselization and the Water Service Man (J. H. Stinebaugh, Chm)
Extended Service Life for Masonry Structures (O. E. Fort, Chm)
Housing Problems of Bridge and Building Forces (H. M. Wilson, Chm)
Trends in Trestle Design and Construction (J. A. Goforth, Chm)
Attracting and Training B&B People (R. D. Bisbee, Chm)

VOLUME 64 (1959)

Committee Reports:

Contracting Work in the B&B Department (W. W. Caines, Chm)
Effect of Preventive Maintenance on Work Equipment (R. H. Miller, Chm)
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VOLUME 65 (1960)

Committee Reports:

Outfit Cars Versus Highway Trailers for B&B Living Quarters (H. M. Wilson, Chm)
Automatic Heating Plants (W. J. Malone, Chm)
Bridge Inspection Procedures by B&B Forces (J. S. Ellis, Chm)
Application of Prestressed Concrete to Buildings and Bridges (A. I. Atkins, Chm)
Annual Programming of B&B Work (J. W. DeValle, Chm)

VOLUME 66 (1961)

Committee Reports:

Protection and Preservation of Bridge Decks and Timber Trestles (C. F. Pavin, Chm)
Inventory Reduction by Local Purchase and Delivery to Job Site by Local Supplier (R. D. Hellweg, Chm)
Simplifying Accounting Methods and Work Reports (J. A. Caywood, Chm)
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Selection and Application of Roofing Materials (W. W. Caines, Chm)

VOLUME 67 (1962)

Committee Reports:

Application of Epoxy Type Materials in B&B Work (J. W. DeValle, Chm)
Performance of Modern Diesel Pile-Driving Hammers (H. L. Chamberlain, Chm)
Changing Responsibilities of the B&B Supervisor (A. R. Dahlberg, Chm)
Maintenance Problems in Buildings Where Newer Types of Construction Have Been Used (N. D. Bryant, Chm)
Preservation of Timber Structures by Treatment in Place (T. L. Fuller, Chm)

VOLUME 68 (1963)

Committee Reports:

Construction Standards and Maintenance of Piggyback and Auto-Handling Facilities (W. H. Rankin, Chm)
Concrete Restoration Techniques in Current Use on Railroad Structures (E. R. Simmons, Chm)
Improved Bridge and Building Tools—Where are We? What Next? (P. E. Scites, Chm)
Installation and Maintenance of Prefabricated or Precast Bridge Structures (T. L. Fuller, Chm)
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VOLUME 69 (1964)

Committee Reports:

Modern Heating, Insulating and Ventilating Methods for Railway Buildings (C. B. Foster, Chm)
Study of Most Economical Method of Renewing Bents Without Disturbance to and from Traffic (R. A. Youngblood, Chm)
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Inspection and Maintenance of Timber Trestles for Increased Wheel Loads (N. D. Bryant, Chm)

VOLUME 70 (1965)

Committee Reports:

Training Bridge and Building Supervisors (C. E. Wachter, Chm)
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Timber Trestle Maintenance, Procedures and Equipment (V. D. Raessler, Chm)

VOLUME 71 (1966)

Committee Reports:

New Material for B&B Work (W. H. Rankin, Sr., Chm)
Tools and Equipment for B&B Work (A. C. Jones, Jr., Chm)
Updating and Maintaining Railroad Track Scales (H. F. Lucas, Chm)
Treating Wastes from Mechanical Terminals (J. G. Clark, Chm)
Methods of Replacing or Repairing Failed Culverts (E. E. Runde, Chm)
Repairs to Steel Bridges (R. R. Gunderson, Chm)

VOLUME 72 (1967)

Committee Reports:

Weathering Steel (J. R. Iwinski, Chm)
Contracting B&B Work (E. E. Runde, Chm)
History of Simple Span Concrete Structures Carrying Railroad Tracks (J. J. Ridgeway, Chm)
Butyl Rubber as a Waterproofing Membrane (J. I. Reeves, Chm)
Small Portable Tools for B&B Work (G. R. Vanderpool, Chm)
Renewal of Bridge and Trestle Ties Under Welded Rail (R. E. Frame, Chm)
Heavy Construction Tools (J. W. Chambers)

VOLUME 73 (1968)

Committee Reports:

Latest Developments of "In-Place" Treatment of Timber Bridges (J. R. Williams, Chm)
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Centralized B&B Assignments Vs. Floating Gangs (G. W. Brenton, Chm)
Tools and Equipment For B&B Work (J. W. Chambers, Chm)
Heavy Construction Tools for B&B Work (F. T. Odgers, Subcommittee Chm)
Portable Power Tools for B&B Work (G. R. Vanderpool, Subcommittee Chm)

VOLUME 74 (1969)

Committee Reports:

Concrete Trestles Ties—Their Manufacture and Installation (A. C. Jones, Chm)
Prefabricated Panels for Bridge Renewals—Practicality and Economics (L. C. Harris, Chm)
Communication Between Management, Supervisors and Men (J. C. Hobbs, Chm)
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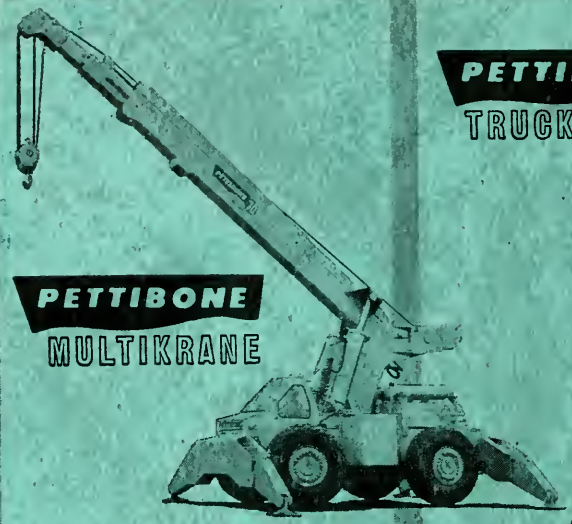

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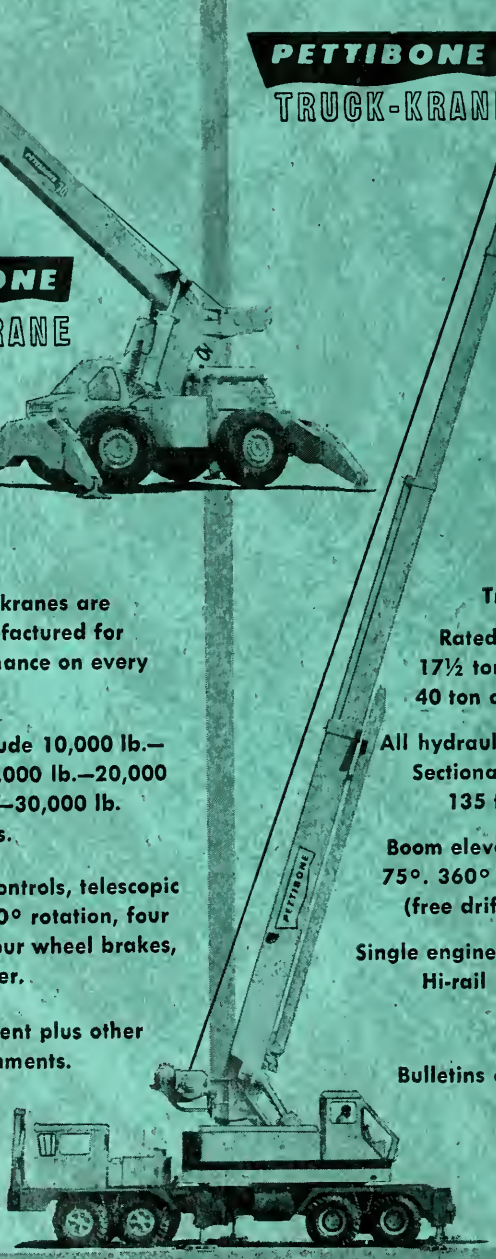

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